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Proceedings of the Twelfth Annual Meeting of the Pacific Slope Branch, American Association of Economic Entomologists

The 12th annual meeting of the Pacific Slope Branch was held at the University of Nevada, Reno, Nevada, June 22 and 23. Although the attendance and number of papers presented were somewhat less than usual, the meeting in general was excellent. A joint symposium with the Pacific Coast Entomological Society on the subject "Arousing Public Interest in Entomology" proved very interesting. The State entomologists, foreseeing that their string of victories over the Federal entomologists in the annual baseball game was about to be broken, refused to play and forfeited the game. The meetings closed with the entomological dinner Thursday Evening.

PART 1. BUSINESS PROCEEDINGS

The meeting was called to order by Chairman Doane at 10:15 A. M. The following were present:

Bartlett, Oscar C., Phoenix, Ariz.
Browne, A. C., Sacramento, Calif.
Campbell, Roy E., Alhambra, Calif.
Carter, Walter, Twin Falls, Idaho.
Cartwright, W. B., Sacramento, Calif.
Cassidy, T. P., Tucson, Ariz.
Cole, F. R., Santa Cruz, Calif.
Dampf, Alf., Mexico City, Mexico.
Doane, R. W., Stanford Univ., Calif.
Doten, S. B., Reno, Nevada.
Doucette, C. F., Puyallup, Wash.
Dean, M. L., Boise, Idaho.
Fisher, C. K., Alhambra, Calif.
Flanders, S. E., Saticoy, Calif.
Flebut, A. J., San Francisco, Calif.
Freeborn, Stanley B., Davis, Calif.
Harned, R. W., A. & M. College, Miss.
Hassan, A. S., Berkeley, Calif.
Herbert, Frank B., Los Gatos, Calif.
Hyslop, J. A., Washington, D. C.
Kent, H. S., State College, N. Mexico.
Lauderdale, J. L. E., Yuma, Ariz.
List, Geo. M., Fort Collins, Colo.
Morrill, A. W., Los Angeles, Calif.
Mote, Don C., Corvallis, Ore.
O'Dell, J. H., Phoenix, Ariz.
Quayle, H. J., Riverside, Calif.
Rivas, E. Coppel, Mexico City, Mex.
Smith, Ralph H., Riverside, Calif.
Snow, S. J., Salt Lake City, Utah.

Van Duzee, E. P., San Francisco, Calif.
Wilson, C. C., Sacramento, Calif.
Volck, W. H., Watsonville, Calif.
Woodworth, C. W., Berkeley, Calif.
Zschokke, Theo. C., Honolulu, T. H.

REPORT OF THE TREASURER

Balance on hand June 16, 1926		$14.69
Refund from main Association for 1926 expenses		13.40
Interest from Bank		.71
PAID OUT		
Typing, mimeographing and printing	$ 9.25	
Dues to Pacific Division, A. A. A. S.	5.00	
Envelopes, Postage, Registry, Telegrams	5.06	
	19.31	28.80
Balance on hand, June 22, 1927	9.49	
	$28.80	

Chairman Doane appointed the following committees: Nominating H. J. Quayle, C. K. Fisher, A. W. Morrill; Resolutions: Geo. M. List, S. B. Freborn; Membership: C. K. Fisher: Auditing, D. C. Mote, A. J. Fleebut, F. R. Cole.

President Harned was then called on, and expressed his pleasure on being able to attend the meetings, and getting personally acquainted with the Pacific Slope members.

FINAL BUSINESS SESSION

Chairman Doane called for the reports of the various committees. The auditing committee reported that they had examined the accounts of the treasurer, and found them correct.

The membership committee presented the following names, and recommended that they be submitted to the parent association for associate membership: C. H. Kinsley, S. J. Snow, C. H. York, G. E. Woodhams, H. B. Sheldon, and W. B. Parker.

The resolutions committee reported as follows:

Resolved, That a hearty vote of thanks be extended to the University of Nevada for providing a meeting place and accomodations for members in attendance.

The nominating committee presented the following names: Chairman, R. S. Woglum, Vice Chairman, Geo. M. List, Sec'y-Treas. Roy E. Campbell.

The reports of the committees were all accepted.

It was moved and carried that the secretary suggest to the associate editor that Pacific Slope Notes be eliminated as a separate department,

and any such news items be incorporated with the Current Notes instead.

The meeting adjourned, to meet next year with the Pacific Division, A.A.A.S. at Pomona College, Claremont, California.

PART II. PAPERS AND DISCUSSIONS

CHAIRMAN DOANE: The first paper is by Mr. F. B. Herbert.

RAPID SPRAYING VERSUS DUSTING IN THRIPS CONTROL

By FRANK B. HERBERT, *Deciduous Fruit Entomologist, Balfour, Guthrie & Company, San Jose, Calif.*

ABSTRACT

Comparing the speed of spraying and dusting. Sprayed 20 acres of prunes in one day, which was practically as fast as dusting, and cheaper, when the cost of materials is considered.

The main argument against spraying where dust could be applied has been that the former was too slow. The writer, however, believing this to be a false statement and that spraying could be done about as fast as dusting, for such insects as the Pear Thrips (*Taeniothrips inconsequens* Uzel), determined to try to demonstrate this fact. Accordingly twenty acres of prunes were sprayed in March 1926, and forty acres in 1927, on the Bubb Ranch near Mountain View, California.

The spraying was started at noon and ten acres were sprayed in four hours that afternoon, and spray was applied to another ten acres in four hours the next morning. The 1926 demonstration proved so satisfactory in results against the Thrips, and in cost compared with dusting which was being carried on at the same time, that liquid spray only was used against the Thrips in 1927. This season forty acres were sprayed in two eight hour days with the same satisfactory results. More spraying was anticipated but the Thrips did not become numerous enough on the rest of the orchard to warrant the use of any control measures.

EQUIPMENT

The equipment used was a five-horse-power spray machine with a capacity of 15 gallons per minute at a pressure of three hundred and twenty-five pounds. To this was attached one Friend Gun with a $\frac{3}{16}$ inch aperature in the disc, discharging nearly the full capacity of the pump, probably 12 or 13 gallons. This was drawn by two horses and driven by one man while another held the gun. In 1926, the operator sat on top of the spray machine and sprayed the trees from one side as the team walked slowly by. Finding it somewhat difficult to dodge

the limbs, this season a two-wheeled trailer was attached behind the spray machine, from which the operator was able to spray with ease.

Materials

Spraying the trees from one side was found to be sufficient as the trees were just coming into blossom, with no foliage present. Two gallons per tree were used, each three hundred gallon tank covering two acres, there being seventy-six good sized fourteen year old trees per acre. Ten tanks were applied each day, in spite of the fact that the spray machine had to be driven nearly half a mile for refilling.

The material used per 100 gallons was one and one-half gallons of distillate emulsion and three-quarters of a pint of Black Leaf Forty, making a cost of one and nine-tenths cents per gallon or $2.82 per acre. The labor cost was $.40 making a total of $3.22 per acre.

Dust was being applied at the same time and the spray was applied as fast as the dust except that it took longer to fill the spray tank. Mr. Bubb was using fifty pounds of 8% Nico Dust per acre, making a cost of $8.50. Here the labor was $.15, making a total of $8.65 per acre. The cost of labor is about one-half that of spraying because only one man was used, although there was as much need for two here as when spraying. The quantity used was somewhat high, the normal amount being about thirty pounds per acre. Even with this reduction, the cost for material was practically double that of the liquid, and also less effective. Both gave a satisfactory kill, although the fumes from the spray lasted fully twice as long as those from the dust. The liquid certainly penetrated into the crevices of the buds better than the dust, and this was where the Thrips were to be found. Dusting to be effective requires still air, while spraying can be done except in very windy weather.

Possibilities

If one were to use a large capacity spray machine, throwing twenty-five gallons per minute, he would be able to spray two rows at the same time, instead of one, making the operation twice as fast, except for filling. If one or two supply wagons were used also for refilling, a tremendous acreage could be covered in a short while. The writer has seen six thousand gallons applied in one day by one of the large machines, without using a supply wagon. At the above rate this would have covered forty acres, and by the use of a supply wagon the acreage could have been increased to forty-five or fifty acres.

Even by using a supply wagon for the machine that was used in this work, the acreage could have been increased to twenty-eight or thirty

acres, or on a normal orchard where there were one hundred trees per acre, the acreage would have run to twenty-two or twenty-five acres.

SUMMARY

From these data one would conclude that spraying for Thrips is as fast as dusting, except for the time lost in filling, which with a supply wagon, would amount to two or three minutes per acre.

Twenty acres were sprayed in one day with a medium sized spray outfit, with a possibility of forty to fifty acres with a large machine.

A large spray machine capable of handling two large guns, would spray a larger acreage per day than the average sized power driven duster.

Spraying is more effective on Pear Thrips than dusting, and less dependent upon good weather.

The labor cost of spraying is somewhat higher than dusting, which, however, is more than offset by the much lower cost of spray materials.

CHAIRMAN DOANE: The next paper is by H. J. Quayle.

SPRAY AND FUMIGATION COMBINATION FOR RESISTANT RED SCALE

By H. J. QUAYLE, *University of California, Citrus Experiment Station, Riverside, Calif.*

ABSTRACT

Results are given of spray alone, fumigation alone, and these in combination against the red scale on citrus trees. Highest efficiency was secured when fumigation followed within a week or ten days the application of oil spray. Oil shown to absorb little if any HCN gas and an oil spray serves as a protective film to the citrus tree, rendering it less susceptible to hydrocyanic acid injury.

Fumigation with hydrocyanic acid gas has always been considered as a satisfactory control method for the red scale on citrus trees until in certain localities in California in recent years this scale has become more or less resistant to HCN gas. Certain oil sprays of recent development have given much better results than the sprays previously used, but still spraying at the present time is not entirely satisfactory because of the results on the scales as well as the effects on the tree.

A couple of years ago a grower who was spraying as well as fumigating observed that good results followed where these treatments were applied within a short interval, and since that time considerable field experience has shown that the combination treatment generally gives satisfactory results. Why this combination treatment gives better results than a double treatment of the same method, the advantage of applying

TABLE 1.—SHOWING A BLOCK OF LEMON TREES THAT HAD RECEIVED TREATMENTS AS INDICATED BELOW. THE FIGURES REPRESENT THE PERCENTAGE OF RED SCALE KILLED

Mineral Seal 2 per cent	6	100	98	65	97	82	99	100	100	99	96	97	98	97	84	98	92	100	99	94	100	99	100	86	96	94	100	30
Trees 7 to 22 Oronite Crys. 2 per cent	5	98	100	66	90	70	97	99	94	98	99	95.5	88	96	93	84	82	99	98	97	96	86	98.5	97	92	95.5	95	26
Trees 7 to 22 Oronite Crys. 1 per cent	4	100	100	93	98	96.5	100	100	98.5	100	100	100	84.5	96	83	99	86.5	99	100	99	100	100	92	93	92	93	91.5	78	25
Trees 7 to 22	3	100	100	97.5	100	88.5	98.5	100	100	100	100	95	92	91	90	100	99.5	100	100	99	100	100	74	68	71	88	49	55	20
	2	99.5	100	97.5	87.4	97.5	100	98	98.5	96.5	95	96.7	94	92.5	80	68.5	74.5	98	90	97.5	97	97.5	91	90.5	60	83	70	69	29
Trees 7 to 22	1	100	100	98	95	97.5	98.5	100	100	100	100	97.5	59	85	74.3	83	78	90.7	51.5	76.7	68	72	25	28	22	27			
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
		Oro. crys. 2% sprayed after fumigation		Pumigation only			Pumigation after spray						Sprayed only					Pumigation after spray					Fumigation only, except row 1. Rows 5-6 sprayed after fumigation, Oronite Crystal 2 per cent.						Ck.

the spray first or vice versa, the length of the interval between treatments, the effect of the fumigation on scales not hit by the spray, and the effect of the combination treatment on the tree, are some of the questions I have attempted to answer.

A portion of a block of lemon trees severely infested with the red scale was sprayed with an oil spray. A part of these trees along with others not sprayed were later fumigated. Other trees that were fumigated only, were later sprayed. The general scheme is shown in Table 1. Trees 7 to 22 in rows 1 and 2 were sprayed with 1 per cent Oronite Crystal oil with calcium caseinate as emulsifier. Trees 7 to 22 in rows 3 and 4 were sprayed with the same oil at a strength of 2 per cent, while the same trees in the 5th and 6th rows were sprayed with Mineral Seal oil at 2 per cent strength with the same emulsifier. Trees 2 to 12 in each of the six rows and trees 18 to 28 in rows 2 to 6 were then fumigated at intervals of from 1 to 10 days after the spray was applied. The figures in the squares represent the percentage of scale killed on each of the trees. It will be noted that there is a considerable range in the results, particularly in the single treatments. Since the figures given are from counts made on the fruit only the results are more favorable to the spray since the sprays effect a better kill on the fruit while fumigation effects a better kill on the leaves and branches.

If it is assumed that each of two treatments kill 90 per cent of the scale (which is not far from the results in practice) such a program should result in satisfactory control which might be explained entirely on a mathematical basis. For example, if there are 1,000 scales on a tree and one treatment kills 90 per cent, there will be 100 scales left. If a second treatment again kills 90 per cent there will be 10 scales left out of the original 1,000 or 99 per cent killed. But a double treatment of either a spray or a fumigation seldom effects such a result.

In the case of fumigation the writer has shown in previous work that scales which survive one fumigation will go through a second fumigation with a higher percentage of survival than scales which have not been previously fumigated. The same result was obtained with ladybird beetles. Where our present oil sprays may kill 90 per cent of the scales on the fruit this degree of control will not be maintained on the wood.

Inasmuch as a spray kills best on the fruit and a fumigation kills best on the branches, these treatments are complementary. In spraying also it is easier to cover the fruit on the outside than on the inside of the tree, while in fumigation the scales on the outside of the tree are more likely to escape because of the less concentration of gas near

the tent. Oil is a wax solvent, hence oil sprays, and particularly the heavy oils that remain in contact with the waxy covering of the scales for some time, tend to dissolve and in some cases to loosen such an armored scale as the red scale and thus make it possible for the gas to more readily reach the insect.

While spraying after the fumigation gave a fairly high kill, 97.7 per cent, this combination was not equal to the kill where the spray was followed by the fumigation, in which case it was 99.4 per cent. If the action of the spray may be accounted for as given above, then there is an advantage in applying the spray first. Another point in favor of applying the spray first is that the presence of oil on the tree tends to make the trees less susceptible to injury from hydrocyanic acid gas.

Hydrocyanic acid gas was bubbled through one of the oils and a test made for HCN as given in Scott's Standard Methods for Chemical Analysis and no HCN found. Another experiment consisted in filling a tray partly full with a 2 per cent sodium carbonate solution and then pouring over this a film of the oil. The tray was then placed in an atmosphere of HCN gas and the alkaline solution later tested for HCN but none penetrated through the oil film. A row of orange trees was next sprayed with a heavy oil spray and this row together with one adjoining not sprayed were fumigated with a high dosage (220%). The trees not sprayed were severely burned with this high dosage while the trees that were first sprayed were scarcely at all injured. This indicates that the oil acts as a protective film against HCN gas and enables a higher dosage to be applied with safety to the tree.

In the first publication issued on HCN fumigation for citrus trees, Bulletin 71 of the California Experiment Station 1887, it was stated that fumigation could not be carried on with safety to the tree unless carbon dioxide was also applied. A considerable amount of CO_2 released under the tent in the case of some of the trees in the present experiments just previous to the time when the charge of HCN was made, but the CO_2 had no protective action on the tree and trees so treated were as badly burned as the check trees.

It has been difficult to account for the high degree of control often observed in the field from the combination of spray and fumigation in view of the fact that it is scarcely possible to avoid missing small areas on the trees and fruit in the spray application. The scale on these areas should succumb no more readily to the fumigation than if no spray had been applied to the trees. The above tests where half of the fruits only were sprayed show that the results on the unsprayed

half were not satisfactory. The difference was sharply marked at the line of the sprayed portion which indicates the necessity of a thorough spray coverage. There is another factor, however, that may enter in field work. Previous experiments have shown that the foliage of the tree absorbs more or less of the gas and that this reduces the kill of the scale. If the covering of oil on the tree prevents absorption of the gas a higher efficiency may thus be secured from the fumigation alone.

TABLE 2.—GENERAL RESULTS OF THE DIFFERENT TREATMENTS AS GIVEN IN TABLE 1

(Figures given for fruit only)

Oil	Strength	No. trees	Scales exmd.	Av. % kill	Range % per tree
Fumigation only (20 cc. dosage)					
		36	6400	84.01	100–49
Spray only					
Oro. Crys.	2%	10	1350	92.1	100–83
Oro. Crys.	1%	10	1850	78.8	94–59
Min. Seal	2%	10	950	91.2	98–82
All sprays		30	4150	87.4	100–59
Fumigation after spray					
Oro. Crys.	2%	22	3650	99.4	100–95
Oro. Crys.	1%	22	3820	97.6	100–90
Min. Seal	2%	22	1500	97.2	100–86
Spray after fumigation					
Oro. Crys.	2%	22	3400	97.7	100–86

Fumigation interval after spray

Oil	Strength	Interval	No. trees	Av. % kill	Range % per tree
Oro. Crys.	2%	Fum. next day	12	99.3	100–95
Oro. Crys.	2%	Fum. 10 days	10	99.7	100–99
Oro. Crys.	1%	Fum. next day	12	98.3	100–95
Oro. Crys.	1%	Fum. 10 days	5	96.0	98–90
Min. Seal	2%	Fum. 3 days	12	97.7	100–94
Min. Seal	2%	Fum. 6 days	10	96.8	100–86

TABLE 3.—SPRAY AND FUMIGATION FOR RED SCALE

Sprayed half of each lemon with Mineral Seal and Calcium Caseinate, 2 per cent, April 6. Fumigated these fruits, April 7, in 100 cu. ft. fumigatorium with 4 cc. of liquid for 35 minutes.

		Results
Lemon No. 1	half not sprayed	22/4 alive
Lemon No. 1	half sprayed	40/0 alive
Lemon No. 2	half not sprayed	35/3 alive
Lemon No. 2	half sprayed	50/0 alive
Lemon No. 3	half not sprayed	70/9 alive
Lemon No. 3	half sprayed	55/0 alive
Lemon No. 4	half not sprayed	19/1 alive
Lemon No. 4	half sprayed	50/0 alive
Lemon No. 5	half not sprayed	50/1 alive
Lemon No. 5	half sprayed	40/0 alive

Totals		Kill
Half of 5 lemons fumigated only	196/27	86.3%
Half of 5 lemons sprayed and fumigated	235/0	100 %
Lemons fumigated only (check lot)	800/54 alive	=93.3%

TABLE 4.—SPRAY AND FUMIGATION FOR RED SCALE

Sprayed with Mineral Seal, 2 per cent, April 15, one-half of each fruit, fumigated April 18, 4 cc. for 35 minutes in 100 cu. ft. fumigatorium.

Lemon No. 1	half not sprayed	90/1
Lemon No. 1	half sprayed	88/0
Lemon No. 2	half not sprayed	100/0
Lemon No. 2	half sprayed	100/0
Lemon No. 3	half not sprayed	60/1
Lemon No. 3	half sprayed	75/0
Lemon No. 4	half not sprayed	100/0
Lemon No. 4	half sprayed	60/0
Lemon No. 5	half not sprayed	60/1
Lemon No. 5	half sprayed	100/0
Lemon No. 6	half not sprayed	70/2
Lemon No. 6	half sprayed	60/0
Lemon No. 7	half not sprayed	60/0
Lemon No. 7	half sprayed	70/0
Lemon No. 8	half not sprayed	100/1
Lemon No. 8	half sprayed	85/0
Lemon No. 9	half not sprayed	50/7
Lemon No. 9	half sprayed	25/0

Totals		
Half of lemons fumigated only	690/13	= 98.2%
Half of lemons sprayed and fumigated	663/0	=100 %
Lemons—half sprayed	460/9	= 98.1%
Lemons—half not sprayed (check)		= 45 %

Other tests included the spraying of half of lemons infested with red scale and the subjecting of these lemons to a fumigation to determine the exact kill of scale on the sprayed half and on the unsprayed half. A sample of a couple of these tests is given in tabular form in tables 3 and 4. It will be noted that in the first lot on the half lemons that had been fumigated only, there was a kill of 86.3 per cent. On the half lemons that had been both sprayed and fumigated there was a kill of 100 per cent. Where the lemons were fumigated only the kill was 93.3 per cent. In the other lot on the half lemons that were fumigated only there was a kill of 98.2 per cent and on the half lemons both sprayed and fumigated there was a kill of 100 per cent. In this case we check also on what the spray alone did and the kill was 98.1 per cent.

In some of the field results it has been difficult to account for the high efficiency of the double treatment when one considers that it is

scarcely possible, practically, to avoid missing small areas on the trees and fruits in the spray application and in these areas the scales should not be killed by the fumigation any more readily than if the trees had not been sprayed. Th above tests show that the spray on one-half of the fruit will not insure results on the other half.

CHAIRMAN DOANE: We will now have a paper by Ralph H. Smith, on Investigations on Arsenical Residues on Apples.

INVESTIGATIONS ON ARSENICIAL RESIDUES ON APPLES

By RALPH H. SMITH, *Citrus Experiment Station, Riverside, Calif.*

(Paper not received)

Adjourned.

MORNING SESSION, THURSDAY JUNE 23

The meeting was called to order at 9:30 A. M.

CHAIRMAN DOANE:—This morning we have a symposium with the Pacific Coast Entomological Society on the general subject "Arousing Public Interest in Entomology." The first paper will be given by Roy E. Campbell.

IS THERE A NEED OF INCREASED KNOWLEDGE OF ENTOMOLOGY

By ROY E. CAMPBELL, *Alhambra, California*

ABSTRACT

The general public, especially in these times of urban trends, does not have a sufficient knowledge of nature. The study of insects should form an important and interesting part of nature study. The increasing importance of insects as man's chief competitors makes it practically necessary that there be a more general knowledge of them. In the study of insects, and methods of combatting them, highly trained specialists are needed, and to provide these a greater interest in entomology must be aroused.

(Full text not submitted for publication)

A GREATER INTEREST IN ENTOMOLOGY FROM A PUBLIC HEALTH VIEWPOINT

By R. W. DOANE, *Stanford University, California*

(Paper not received.)

CHAIRMAN DOANE: The next paper will be read by the Secretary.

THE RELATION OF THE PUBLIC'S KNOWLEDGE OF INSECTS AND THEIR DESTRUCTIVENESS TO QUARANTINE ENFORCEMENT

By W. C. JACOBSEN, *Chief, Bureau of Plant Quarantine and Pest Control, California State Department of Agriculture, Sacramento, Calif.*

ABSTRACT

Growers, entomologists and others having a knowledge of economic insects either detailed or limited instinctively as a result of contact with pests are helpful and sympathetic to plant quarantine enforcement. Lack of interest in insect pests or their destructiveness by the general public is manifest in an apathy to quarantine enforcement work, probably due primarily to the personal inconveniences attendant. Popular yet brief accurate press items, also simple teachings in elementary schools and similar educational aids, are undoubtedly helpful.

In discussing a subject of this nature we must assume that certain definite groups which comprise our general public have a knowledge of insects, their destructiveness if pests, their value if beneficial, and, on the other hand, we know from experience that the vast majority of individuals have such a limited knowledge of this subject that as an aid to plant quarantine enforcement it is negligible. The inconvenience of inspection whether at maritime ports or at border highway stations overshadows any desire to learn more of the importance of pest prevention, unless information concerning the subject has been assimilated while at leisure and in such a way that traveling progress is not interrupted.

This probably accounts for the fact that passengers on vessels from Hawaii, whence might come the melon and Mediterranean fruit flies, are, as a general rule, better acquainted with the whys and wherefores of quarantine inspection than autoists who are hurrying to reach a destination. Short talks are provided by certain steamship companies on their boats enroute, supplemented by carefully illustrated and explanatory booklets, giving reasons for keeping out menacing pests at a time when the passenger looks upon any change of conversation or activity as a diversion from the ordinary routine encountered in the vessel's shoreward progress.

We can enumerate some of the groups who know of insects. Agriculturists, if successful operators, must sooner or later contact insect pests in an actual and real manner; hence, unconsciously acquire a fund of information which must be an aid in preventing pest introduction. Costs of control measures to combat destructive insects teach the grower that additional pests will increase overhead of crop production. He is consequently sympathetic toward plant quarantine activities from a self preservation viewpoint. He has at his command, sources

of information, e. g., from extension service agents, regulatory officers and insecticide salesmen, which augments his knowledge already increasing from personal experiences. He is loath to see additional pests introduced.

Individuals who have had educational advantages embodying biological curricula or those to whom entomology naturally appeals are readily convinced. Still others are attracted to a knowledge of the subject because of the beauty of some species, such as butterflies, certain beetles and so forth, and are led to investigate further with reference to the habits not only of their original hobby, but also of other members of this interesting group of the animal kingdom. Freak occurrences involving insects lead to a recognition that in the subject of entomology there are bits of pleasing stories. Thistle butterfly flights, grasshopper or locust plagues, army worm marches, jumping beans and auto radiators plastered with moths, flies or butterflies are frequently starting points for the layman to gain entomological information if he chances to question the right person.

This is similarly true of garden lovers, who, because of pests on their choice flowers or coveted "personally conducted" vegetables, want to know immediately and absolutely what the bug is and how it can be annihilated. Again, if termites, for example, begin to show evidence of annoyance and property damage, a personal interest develops in the party affected.

So far, those mentioned have had individual contacts either directly or indirectly with insects in such a manner that it is not difficult to point out to them the value of stemming the arrival of new pests. There are many others directly in contact with phases of agricultural production and marketing who know of the many Entomological problems, but in the main their information is quite casual.

The average everyday person regards the subject of entomology as demanding interminable study; as a sort of wizardry that only a technical scientist can comprehend and believes the absorption of even popular data on insects as beyond his reach. If he could be taught the affects possible on his daily bread or the foods he enjoys both as to condition and cost he might better understand the profound importance of pest suppression. Too frequently the whole matter of whether insects will concern an individual or not is dependent upon how it affects his personal convenience. If inconvenient, an apathy can grow up, in spite of potential damage apparent, to the whole gamut of pest suppression measures, be they spraying, dusting, or plant quarantine regulations.

To overlook entomologists in their relation to plant quarantine enforcement would be remission of duty. Here we assure ourselves that we deal with a group comprising the highest trained participants in insect lore. The knowledge of principles of insect distribution and ecology reach their highest levels among this fraternity, and here too the enormous destructiveness of insect crop feeders is well understood. Fortunately, we can say that the vast majority of specialists in this field, together with the plant pathologists, are our mainstays of helpfulness. Yet, how many entomologists dogmatically predict the complete ineffectiveness of quarantine promulgations? The mere predictions might be harmless but there are, unfortunately, a few who believe themselves above the plane of being quarantine violators and who may ignore the dangers they subject agriculture to in the pursuit of their profession. In collecting specimens of insects they have been known to transport live injurious insects into uninfested territory not only a few miles but between counties, yes, even between states. At this moment we recall an incident at such a session as this of an insect of sufficient consequence to demand a federal quarantine being illegally transported into California where the host crop was free of this and similar pests.

Nurserymen and growers credit scientists and even regulatory officers with being responsible for pest distribution and unfortunately at times they are correct. Last year we chanced upon a quarantine inspector in another state transporting an injurious insect into clean territory merely to satisfy the curiosity of a convention. In both cases we believe the incidents happened unthinkingly, yet, we take this opportunity to suggest care and thoughtfulness of the consequences when dealing with potential or known crop destroying insects.

This leads to the mention of groups of persons who should have at least a chatting acquaintance with insects and their damage. Bankers at this day and age control many acres of fertile farm lands, either through mortgages, term loans, or actual bank ownership from foreclosures. One of the economic difficulties this group is now encountering is land management, generally entrusted to a city bred subordinate officer. He may know a little about entomology but generally prides in the remark that his business is banking not farming. We might place in a similar category city dwelling industrial executives and attorneys who have no patience with explanatory information but will take up the matter of being "insulted" by the inspection officer with "your superiors" or even the Governor. Fortunately, in California, where agricultural resources are recognized as basic, these occurrences are limited and pest knowledge is sought and accepted in the main.

We hold that attorneys should be more sympathetic toward gaining some entomological information. They are governed by the rules of proof and precedent laid down by man-made laws. Could they realize that biological laws which govern in matters of pest control or prevention could often be correlated with sound reasoning rather than opposed to judicial reasoning, broader interpretations in court cases involving quarantine would result. A justice of the peace in a farming community instinctively is helpful, but professional attorneys and jurists are prone to uphold the property rights of the individual rather than the state or nation-wide rights to protection against pest invasion. Technically, perhaps right, but biologically in error.

Economic surveys are made of areas to determine their value for agriculture or their ability to stand the burden of bonded indebtedness for irrigation, reclamation or drainage works. Insignificant factors are given detailed consideration, yet, how often will the engineers who figure a project even give semblance of thought to pest invasion possibilities, or the security from such invasion by adequate regulatory enactments? We personally have heard it suggested but once. Even established or native insects are overlooked. Land values can be depreciated in a time far shorter than that generally allotted for paying off indebtedness if factors governing insect pest possibilities are not countenanced. Specialists in other lines of agricultural activities frequently ignore entomological information when it could be engaged to advantage. A profitable agriculture can be relegated to virgin soil conditions by lack of proper understanding of pest damage.

The value of a gained familiarity, even though limited, of insects and the crop losses caused by them is remarkably demonstrated in the case of some of our common carrier employees. It is true that they are responsible if quarantine regulations are violated by their companies but it has been surprising how their contacts with horticultural inspectors have built up at least a speaking acquaintance with some of these "terrible bugs and contagious plant microbes." Further, a group of executive officers of transportation companies meet with our Western Plant Quarantine Board each year to keep in touch with pest developments and serve as a clearing house each for their own lines whenever pest or plant quarantine matters arise. They have agricultural tonnage to transport; hence, should insect damage reduce the quality of commodities be it fruit, field crops or vegetables, or even cut down the volume, they have a loss of revenue. These men have developed a knowledge of insect damage which has materially aided plant quarantine enforcement both at origin and destination.

The question will be asked—how can a knowledge of insect pests and their damage be bettered if it is helpful? Entomologists have an exceedingly interesting, almost intriguing story if it can only be told so the public can grasp the thought. Professional standards are not necessarily deprecated if technical verbiage can give way to some extent to a simple diction so long as the facts stated are sound. Among the most mystifying yet interesting processes in life are the metamorphosis stages in insects, yet, the average layman has difficulty in comprehending even the beginning thoughts along this line. At least the outstanding pests could be written about in simple style, indicating the relationships in life history stages to the effects on the host. Man is interested in his foods, his house, his garden and his clothing. News reporters evidence their use for such material but too frequently they consider this type of data as "freak stuff." This can be overcome and in truly farming communities has already to a large degree. Conservative, simple and carefully illustrated articles are helpful and admittedly demand patience. It will certainly not detract any from the public support to entomological work of any kind.

School children in Honolulu make regular visits to the plant inspection house there. They learn of the biological control work and ask of the need for it, what brought it about, where did the serious pests come from anyway and couldn't they have been stopped. Their line of questioning involves the very things many other folks would like to know. Schools could well encourage more insect stories if only they could be supplied in simple form. Insect pests thus become widely known, superficially to be sure, but understandingly.

We conclude that any sound, truthful knowledge of insects and the losses caused or the benefits resulting in certain cases, is an appreciable aid in plant quarantine enforcement. If the funds expended to adequately maintain quarantines represent the premium on an insurance policy to protect against pest introduction, then, certainly a knowledge of crop consuming pests is the impelling interest in obligating the state or the nation to make application for such an insurance policy and furnishes the continued impetus to see the premium paid, as well as causing the public generally to recognize a patriotic responsibility.

CHAIRMAN DOANE: The next paper is by Mr. Cain.

INTERESTING BOY SCOUTS IN ENTOMOLOGY

By BRIGHTON C. CAIN, M.A., *Naturalist for the Oakland District Council Boy Scouts of America*

ABSTRACT

Learning by doing is a watchword of Scouting. Scouting and Outing go hand in hand, so entomology is well suited to the scout method of training. An important factor in character building is a better understanding and appreciation of Nature. Insects with their limitless varieties of forms, array of colors, diversity of habits and their interrelationships serve admirable for studying Nature. One method of scout advancement is through Merit Badge activities, and one of the many subjects for which a scout can qualify for such a badge is Insect Life. Boys show a keen interest in collecting and field studies of insects, especially if given a little encouragement and assistance. Field trips, or "bug hikes" serve to keep up the interest.

It is only a few short years since Scouting was organized in this Country and given an official stamp of recognition from our Government, but even seventeen brief years have been sufficient to establish it as a great force in character education employing sound pedagogical methods. So perhaps it may be well for us to consider briefly how Entomology may be vitalized in the Scouting Movement.

The genius of Scouting is found in its dynamic qualities, for "Learning by Doing" is ever the watchword. The project method and the recreational methods of instructing our youths are a real contribution from the Scouting Movement. And since Scouting and Outing go hand in hand, a subject like Entomology is admirably suited to the scout method of training.

A very important factor in building character is the bringing of the individual into better understanding and keener appreciation of the unfathomable beauties of Nature and of Nature's God. Where, in all the world about us, is there a more wonderful field than Entomology for just this sort of thing? With the seemingly limitless variety of forms, the vast array of colors, the great diversity of habits and the marvelous interrelationships, presented by the insect world what a golden opportunity is ours for instilling *real* Reverence in the boys of today, who will soon be the "men of tomorrow."

The test of a good Scout is whether he is really *living*, in his everyday life, the Oath and Law to which he subscribed on joining the Movement. But in addition to this a wide-awake youngster is always keen to make progress along the lines of scout advancement. The highest development of the educational program in Scouting is in the field of Merit Badge activities.

We find in that field a group of 76 different subjects in which a scout may qualify for a badge of merit, upon fulfilling certain nationally

prescribed requirements. A scout may pick and choose as he pleases from this group, participation in this phase of the program being purely voluntary. A few subjects are particularly designed to render the boy capable of great service to others in times of emergency, but most of the remainder serve to open to the lad a wide variety of vocational and avocational interests which will be of tremendous value to him throughout his life. Naturally many merit badge subjects are directly concerned with the out-of-doors, and one of these is designated as "Insect Life."

That title was happily chosen, for emphasis is placed on the *living* insect, and a knowledge of its habits and habitat. To be sure, a collection of 50 insects, collected, mounted and labelled by the scout is one of the requirements for the badge, but the boy is also required to breed through all its stages at least one species of insect, to record his observations of an artificial ant nest or a bee colony for a period of at least two weeks, and then to go afield with the examiner and point out to him, in their *natural environment*, a considerable number of living insects. In short, the scout is encouraged to "study Nature and not books."

The printed page is, however, *one* of the means to the end of "Arousing Public Interest in Entomology." Our scouts have been aided by access to a nature library at Scout Camp containing a goodly number of books on Entomology. Perhaps mention should here be made of the following as being particularly helpful:

Insect Life Merit Badge Pamphlet by J. C. Bradley and E. L. Palmer of Cornell

Insects of Western North America by E. O. Essig

American Insects by V. L. Kellogg

Introduction to Entomology by J. H. Comstock

The first named reference was published by the Boy Scouts of America in 1925. While largely a compilation of previously published illustrations and material, it is very useful to a scout, because it specifically deals with the requirements for the Insect Life merit badge. It is very entertainingly written and is made even more intriguing by a marginal gloss by Mrs. Comstock.

A further means of stimulating interest in Entomology amongst our Scouts is the access at Diamond Camp (which, by the way, is in the Oakland hills only 5 miles from the City Hall) to a collection of several thousand insects made by the writer during the past several years in many western states. This serves not only as a source of information, but also serves to create interest not otherwise aroused.

The maintaining of a ready source of supply of needed equipment,

such as pins, forceps, materials for killing-bottles and nets, etc., at the lowest possible cost, is also helpful in promoting interest in six-legged creatures.

The playing of nature games, which involve insects, at Troop meetings and on week-end Nature Rambles likewise serves to create and maintain interest.

The sincerely cordial interest and desire to be of service on the part of the entomologists affiliated with the nearby University of California and the California Academy of Sciences in San Francisco cannot be overlooked as a great aid to those scouts who have developed through Scouting an unusual interest in the study of insects.

Last but not least, perhaps, in developing entomological interest in our lads are the frequent trips afield, often specifically designated as "Bug Hikes," but always to keep alert to everything in nature that can challenge our interest. Perhaps thru these various means it will be possible to develop a few real field naturalists, the dearth of which has been rather keenly felt for many years.

A new undertaking with the writer is the taking of nature movies which he is employing successfully with birds, mammals and reptiles. It is hoped to turn it also to insects and perhaps *that* may be a means of vitalizing the true, weird tales of insect activity that can so readily hold a group of boisterous youngsters speechless at some indoor troop meeting next winter.

In conclusion, let it be said that all of this work is somewhat of a pioneer effort and much is yet to be learned, as the writer is the first, if not the only, trained naturalist to be employed by a Scout Council on a full time, year round basis to promote the nature program. Since at least two Oakland Scouts have decided to enter Entomology as a profession and scores of others have developed a healthy outdoor interest in insects as a hobby, and since "*Bugs*" Cain has become known to at least twenty-five hundred scouts as a guide who would bring them into a closer harmony with the birds, the bugs, the reptiles, the rocks and the stars, perhaps the experiment has not been in vain.

CHAIRMAN DOANE: The next paper is by Mr. Freeborn.

EFFICIENT AND PRACTICAL CONTROL OF HOUSEFLIES

By STANLEY B. FREEBORN, *University of California, Davis, Calif.*

(Paper not received).

CHAIRMAN DOANE: The next paper will be by Mr. S. J. Snow.

EFFECT OF OVULATION ON THE SEASONAL HISTORY OF THE ALFALFA WEEVIL

By S. J. SNOW, *Bureau of Entomology, Salt Lake City, Utah*

(Paper not received)

CHAIRMAN DOANE: The chairman is down for the next paper.

DIFFICULTIES IN MOSQUITO CONTROL

By R. W. DOANE, *Stanford University, Calif.*

ABSTRACT

This paper is limited to a discussion of some of the problems that arise in the Mosquito Abatement Districts in the San Francisco Bay Region where reclamation and industrial projects have complicated a situation that was at first a comparatively simple one.

In 1905 Prof. H. J. Quayle first demonstrated the possibility of controlling mosquitoes in the San Francisco Bay Region at a comparatively small cost. He found that the most important part of his work was on the salt marshes, for the mosquitoes that were breeding there would fly inland and become an almost unendurable nuisance. He found that most of the breeding places on the marshes could be controlled by simply draining the tide pools that were filled during the times of the monthly high tides but were not reached by the ordinary daily tides. At this time, too, he met the problem of the dyked lands and a large part of his time and available funds had to be expended in meeting the difficulties presented there.

With the organization of the Mosquito Abatement Districts under the law passed in 1915 these same problems had to be met and solved. In districts where there were no dyked areas a comparatively small amount of ditching, supplemented with some oiling, was all that was necessary to get effective, economical control of the marsh-breeding mosquitoes. But these ideal, primitive conditions did not last long. Salt companies and other concerns began to extend the areas used for industrial purposes and this meant more dykes and ditches which often formed troublesome breeding places.

The evaporating beds used by the salt companies are, in themselves, not a nuisance, for the water in such places is so dense that the mosquitoes will not breed in it. The ditches made while constructing these dykes do, however, often make prolific breeding places unless measures are taken to prevent water collecting and standing in them. Connecting

these ditches with the open bay or with wide sloughs in such a way that the daily tides will ebb and flow in them will also be effective.

Most trouble comes about on the lands that are being drained or have been previously drained and reclaimed for agricultural or other purposes. As soon as these lands begin to dry a great network of cracks is formed. These cracks are from a few inches to a foot or more in width and they may be as much as two to four feet deep. Before the land is thoroughly drained or after heavy winter rains the water that is to be found in these cracks is often swarming with mosquito larvae and pupae. Many of these cracks are often covered, or nearly covered, with the marsh grasses so it soon becomes a difficult and dangerous undertaking to try to walk over such lands. When the cracks are first forming a measure of mosquito control may be obtained by oiling the breeding places that can be discovered but this is a very expensive and unsatisfactory undertaking at the best. A little later, oiling becomes impractical and unless the water level can be lowered so the water will not stand in these cracks, the whole area becomes a serious menace. A good series of self acting flood gates often supplemented by pumps makes the most efficient drainage system. As soon as the land can be plowed and the cracks filled the land ceases to be a menace.

The law under which these districts were organized gave the boards of trustees power to take any steps that they deemed necessary for controlling mosquitoes, but the wording of the law was such as to make it seem necessary for the district to bear all of the expenses of such work. Some of the districts had thoroughly drained all of their tide lands and had them in such a condition that the mosquitoes could be controlled with but little trouble and expense. When some of these lands began to be reclaimed for agricultural or other purposes the conditions described above were brought about and it became necessary for the district to again expend large sums to correct the conditions brought about by the companies that were reclaiming the lands. This did not seem fair to the residents of these districts and in 1927 they asked that the law be revised so as to give the trustees of the district power to compel the owner of any land to bear the expense of any mosquito control work that was made necessary by his own operations or changes on his property. This law was passed and it is hoped that it will materially help the trustees of the various districts to meet this difficulty.

Another difficulty even more serious confronts some of the Abatement Districts. Unfortunately all of the tide lands in the bay region are not included in organized Mosquito Abatement Districts. It too frequently

happens that some of the districts will care for all of the breeding places in their own districts but this work avails them little if they have an invasion of mosquito pests from some unorganized district. The two most common species of mosquitoes, *Aedes dorsalis* and *A. squamiger*, that breed on the salt marshes fly, or are carried by the winds, for several miles. They have been captured in the foothills five or six miles from their nearest breeding places.

Careful observations during 1926 and 1927 have shown that the open bay is no barrier to their migrations. Serious invasions of mosquitoes have been experienced in the districts on the west side of the bay when it was definitely known that few or no mosquitoes were breeding on that side of the bay. Inspections have shown that at the time of these invasions the tide lands on the opposite side of the bay were swarming with mosquitoes and the pools and other breeding places were abundantly filled with larvae and pupae. We have not yet been able to mark any mosquitoes on the east side of the bay and capture them on the west side but the mass of evidence that has accumulated in our studies of this situation shows beyond a doubt that great swarms, particularly of *Aedes squamiger*, do come from across the bay and make life miserable for people living from five to fifteen miles from the known breeding places. The distances which they must fly over the water varies from one and a half to three miles.

It seems that the only remedy for this condition is for us who are tormented by these foreign foes to prevail upon our neighbors across the bay to organize abatement districts and destroy these breeding places. Or if they feel that they must have the mosquitoes they should keep them at home. The smaller towns in Alameda County have signified their willingness to cooperate in this but the apathy of the residents of the bigger cities has so far prevented the organization of the district.

CHAIRMAN DOANE: The next paper is by Mr. Carter.

ISOLATION OF CERTAIN YEASTS AND ALLIED FORMS FROM *EUTETTIX TENELLUS* BAKER

By WALTER CARTER, *Bureau of Entomology, Twin Falls, Idaho*

(Paper withdrawn for publication elsewhere).

The following papers were read by title.

PROGRESS REPORT ON THE USE OF PETROLEUM OIL AS AN INSECTICIDAL SPRAY

By E. R. DEONG, *University of California, Berkeley, Calif.*

THE USE OF OIL SPRAYS ON CITRUS DURING 1926

By R. S. WOGLUM, *Entomologist, California Fruit Growers Exchange, Los Angeles, California*

SIGNIFICANCE OF MID SEASON UNIT COUNTS ON RESISTANT BLACK SCALE

By A. F. SWAIN, *Citrus Entomologist and* CHAS. E. DUGGAN, *Field Entomologist, California Cyanide Company, Los Angeles, California*

NOTES ON THE PHYSIOLOGICAL EFFECTS OF SATURATED (WHITE) OIL ON CITRUS

By HUGH KNIGHT and CHAS. D. SAMUELS, *California Spray Company*

Before adjournment for the final business session Mr. J. A. Hyslop, of Washington, D. C., gave a talk on the Insect Pest Survey, explaining the nature of the work, and what is expected to be accomplished. A request was made of all entomologists to assist by sending in reports of insect outbreaks, no matter how seemingly trivial or important.

FLUOSILICATES AS INSECTICIDES FOR THE JAPANESE BEETLE[1]

By WALTER E. FLEMING,[2] *Associate Entomologist, Fruit Insect Investigations, Bureau of Entomology, United States Department of Agriculture*

ABSTRACT

The insecticidal value of the fluosilicates for control of the Japanese beetle was studied during the past two seasons. The results indicate that the fluosilicates of barium, potassium and sodium are of the same order of toxicity as acid lead arsenate.

INTRODUCTION

The attention of entomologists was first drawn to the possible value of the fluosilicates as stomach poisons for phytophagous insects by Marcovitch (4, 5)[3] two years ago when he reported the results of his experiments with sodium fluosilicate in controlling the Mexican bean beetle. Since that time the fluosilicates have been tried with a certain

[1]Contribution No. 18 of the Japanese Beetle Laboratory, Riverton, N. J.

[2]The writer wishes to acknowledge the assistance rendered in this work by K. B. Rogers, J. M. Conroy, H. W. Coward, and A. T. Hawkinson who were temporarily connected with the Japanese Beetle Laboratory.

[3]Reference is made by number to "Literature Cited," p. 691.

amount of success on other leaf-chewing insects by Baerg (1), Ingram (2), Langford (3), Osborn (6) and Tattersfield and Gimingham (7). The experiments reported in this paper were begun in July, 1925, at the Japanese Beetle Laboratory in order to gain a better understanding of the fluosilicates and to produce, if possible, new materials for use in controlling the Japanese beetle, *Popillia japonica* Newm.

Physical and Chemical Properties of Fluosilicates

The fluosilicates are crystalline compounds more soluble in water than acid lead arsenate. The approximate amounts of the compounds which dissolve in 1000 parts of water were determined at room temperature by shaking an excess of the materials with 200 cc. portions of distilled water for fifteen hours, and, after the suspended material had settled, analyzing aliquot portions of the supernatant liquids. The results of these tests indicate that the following amounts of the compounds dissolve in 1000 parts of water: acid lead arsenate 0.16 parts, barium fluosilicate 0.34 parts, potassium fluosilicate 0.94 parts, cadmium fluosilicate 2.00 parts, calcium fluosilicate 3.11 parts, sodium fluosilicate 7.14 parts, copper fluosilicate 23.20 parts, strontium fluosilicate 32.00 parts, aluminium fluosilicate 40.00 parts, and zinc fluosilicate 50.00 parts. These fluosilicates were pulverized in a ball mill and dusted on foliage in order to study their covering and adherent properties. It was observed that the particles of the fluosilicates do not settle readily on the leaves and that a large majority of the particles which do adhere to the foliage are easily washed off by rain.

Modern spray practices are complicated procedures. Combinations of spray materials are frequently made to avoid separate applications. It is often desirable to combine a stomach poison with Bordeaux mixture, lime-sulfur solution, or soaps. In an attempt to throw some light on the compatibility of the fluosilicates with these sprays, a series of tests were made with these materials and the fluosilicates of potassium, sodium, barium, and calcium.

Bordeaux mixture (4–4–50) was added to the powdered fluosilicates in such proportions that the fluosilicates were in the concentration of 5 pounds per 50 gallons. The combinations were shaken for five minutes and then allowed to stand. It was found that the pale blue color of the Bordeaux mixture precipitate is changed to a greenish-blue and that the amount of soluble copper in the mixture is increased in the presence of the fluosilicates. Since Bordeaux mixture is essentially a mixture of copper hydroxide, calcium hydroxide, and calcium sulfate, it is very probable that the increase in the amount of water-soluble

copper in the combination is due to the formation of some copper fluosilicate. The excess alkali in the Bordeaux mixture tends to decompose the fluosilicates into the fluorides and this reaction possibly accounts for the change in color of the precipitate.

Soap solutions, containing 5 pounds of sodium or potassium oleate per 50 gallons, were shaken with the fluosilicates for five minutes and then allowed to stand. As was anticipated, no reaction is apparent with the fluosilicates of sodium or potassium, but the fluosilicates of barium and calcium form the insoluble oleates. The free alkali, which forms when soaps hydrolyze in water, tends to convert a certain part of the fluosilicates into fluorides.

The tests made with lime-sulfur solution (1:9) and fluosilicate indicate that the mixtures are not compatible. When fluosilicates are added to lime-sulfur solution, a yellow precipitate is formed which gradually turns white and hydrogen sulfide is evolved. The reaction is vigorous with the fluosilicates of sodium and calcium and moderate with the potassium and barium salts. The rate of reaction seems to increase in the order barium, potassium, calcium, and sodium which also is the order of increase in solubility of these compounds.

Relative Toxicities of Fluosilicates and Acid Arsenate of Lead

It is necessary to confine the Japanese beetles in cages in order to keep them under observation because the insect, although gregarious, is a strong flier and makes frequent changes from one food plant to another. Fifty beetles, fresh from the field, were placed in each cage. Two cages of beetles were not given any food, to determine the mortality caused by starvation during the course of the experiment. Untreated smartweed, a favorite food plant of the beetle, was placed in two cages to serve as a check. Smartweed dusted with acid lead arsenate was put in two cages, and the other pairs of cages were filled with smartweed which had been dusted with the different fluosilicates. A daily record was kept for five days after the start of the experiment on the number of beetles dead in each cage, those apparently sick, those apparently unaffected and on the general reaction of the beetles to the different compounds.

The results of experiments made at different times throughout the past two summers indicate that some of the fluosilicates are just as efficient as acid lead arsenate in killing the beetle and others are of little value. The toxicities of the fluosilicates, expressed as the percentage efficiency of the compounds in killing as compared with acid

lead arsenate[4] are as follows: cadmium fluosilicate 6.9 ±1.18per cent[5], aluminium fluosilicate 11.6 ±0.08 per cent, copper fluosilicate 12.6 ±1.55 per cent, strontium fluosilicate 29.8 ±1.84 per cent, zinc fluosilicate 40.3 ±0.90 per cent, calcium fluosilicate 53.8 ±4.09 per cent, barium fluosilicate 97.5 ±3.20 per cent, potassium fluosilicate 98.2 ±2.75 per cent, sodium fluosilicate 109.2 ±5.38 per cent. The beetle feeds extensively on foliage dusted with the fluosilicates of cadmium, aluminium and copper; it feeds moderately on foliage dusted with fluosilicates of strontium, zinc and calcium; and it feeds very lightly on foliage dusted with the fluosilicates of barium, potassium and sodium. It seems as though the fluosilicates of cadmium, aluminium and copper can be considered as having very little toxicity for the Japanese beetle. The fluosilicates of strontium, zinc and calcium are moderately poisonous, and the fluosilicates of barium, potassium and sodium seem to be of the same order of toxicity as acid lead arsenate.

Effect of Fluosilicates on Foliage

Experiments with the fluosilicates on foliage were carried out in 1925 and 1926 in the insectary and in the greenhouse. Fluosilicates were dusted on apple, peach, bean, and smartweed foliage. Sprays containing from 1 to 5 pounds of the fluosilicates were also used on the plants.

The results of these laboratory experiments indicate that the foliage of apple, peach, and bean is not injured to any extent by the fluosilicates of barium, potassium and sodium. The other fluosilicates cause more or less severe damage to the foliage of these plants. All of the fluosilicates injured smartweed foliage.

Effectiveness of Dilutants in Preventing Foliage Injury

The damage to foliage, to some extent at least, results from excessive amounts of soluble fluosilicate in contact with the surface of the leaf.

[4]The percentage efficiency was calculated by dividing the number of beetles killed by the fluosilicate by the number killed by acid lead arsenate at the end of the third day under the same conditions.

The comparisons were made at the end of the third day because the number of beetles dead in the cages without any food sometimes became so large after this period of time that it is difficult to decide whether the deaths in the groups of beetles exposed to poisons are caused by the action of the poisons or by starvation. The mortality due to starvation was usually low over a three day period.

The average mortality of beetles in 26 triplicate tests with acid lead arsenate dust was 75.4 ± 1.79 per cent. These tests were made at intervals throughout the seasons of 1925 and 1926.

[5]The probable error was calculated by the formula: $0.6745 \frac{S.D}{\sqrt{n}}$

It seemed very probable that a mixture of a fluosilicate with some material could be developed which would afford protection to foliage without impairing the insecticidal value of the fluosilicate. A series of tests was accordingly made to determine the value of different materials in preventing the injury of the fluosilicates of sodium, potassium, barium and calcium to smartweed foliage. The smartweed plant was chosen because of its apparent sensitiveness to fluosilicates.

Hydrated lime has been recommended by Baerg (1), Ingram (2), Marcovitch (4, 5) and others as a means of overcoming the injury by fluosilicates to foliage. Lime has no detrimental effect on smartweed foliage. A series of mixtures of lime and the fluosilicates were prepared, which varied in composition from 10 per cent to 90 per cent lime, and dusted and sprayed on the foliage. It was found that the injury tends to decrease as the proportion of lime in the mixtures is increased. No injury results from mixtures of the fluosilicates of barium and potassium with the higher proportions of lime. The calcium and sodium salts, even in the highest dilutions, still have a detrimental effect on the foliage of this plant.

In the studies with talc as a dilutant for the fluosilicates, it was found that talc tends to decrease the injurious action only as long as no moisture comes in contact with the mixture on the leaves. When talc-fluosilicate mixtures are sprayed or when moisture comes in contact with the dusts, severe damage to the foliage results.

Charcoal, clay, flour and starch seem to act as mechanical dilutants, tending only to delay the action of the fluosilicates.

"Coated fluosilicates" were prepared by stirring the pulverized fluosilicate into a benzene solution of lead oleate and then evaporating off the solvent. Lead oleate was used in proportions of 1 per cent, 2 per cent, 3 per cent, 4 per cent, and 5 per cent. It was found that when these mixtures are dusted on foliage, the particles settle readily on the leaves and adhere much better than the untreated particles. The "coated fluosilicates" prepared by this method do not mix readily with water and consequently do not make good sprays. It was necessary to use vigorous agitation in applying the sprays of these mixtures to foliage. The results of these experiments indicate that lead oleate does not protect the foliage from the injurious action of the fluosilicates. The mixture of barium fluosilicate containing 2 per cent lead oleate seems to be the best of all of the fluosilicate-lead oleate mixtures.

Effect of Dilutants on Toxicity

The effect of the different dilutants on the toxicity of the fluosilicates was studied by confining groups of beetles in cages, as outlined previously, with smartweed dusted and sprayed with the mixtures and observing the resulting mortality.

It was found that the addition of lime to the fluosilicates of barium, potassium, calcium and sodium makes the treated foliage more palatable to the insect. The extent of feeding increases progressively with the increase in the lime content until in the higher percentages of lime the foliage is entirely consumed. At the same time, the addition of lime decreases the killing power of the fluosilicate. The decrease in toxicity of the fluosilicates with the addition of lime is due to the use of a non-poisonous dilutant and to the conversion of a part of the fluosilicate into the less toxic fluoride by the lime.

The results of the experiments with the lead oleate-fluosilicate mixtures indicate that lead oleate does not affect the toxicity of the fluosilicates of sodium and potassium but it does seem to increase the toxic action of the barium and calcium salts. This apparent increase in the toxicity of the fluosilicates of barium and calcium may be due to fact that the lead oleate is not changed into a soluble oleate in these cases and tends to increase the adhesion of the fluosilicate particles to the surface of the leaf. It is possible to make much heavier coatings on leaves with the barium fluosilicate-lead oleate mixtures than with the untreated barium fluosilicate. Barium fluosilicate "coated" with 2 per cent lead oleate, which seems to be the best of these mixtures, has 125 per cent the efficiency of acid lead arsenate in killing the beetle.

Summary

The results of the laboratory studies of the physical, chemical and insecticidal properties of the fluosilicates may be summarized briefly as follows:

1. The fluosilicates are crystalline compounds more soluble in water than acid lead arsenate.
2. The particles of fluosilicates do not adhere readily to foliage.
3. Fluosilicates, in general, do not form compatible mixtures with Bordeaux mixture, lime sulfur solution, and soap solutions.
4. The fluosilicates of cadmium, aluminium, and copper are not efficient insecticides for the Japanese beetle, when compared with acid lead arsenate; fluosilicates of strontium, zinc and calcium are moderately efficient; and the fluosilicates of barium, potassium and sodium are of approximately the same order of toxicity as acid lead arsenate.

5. The foliage of apple, peach, and bean is slightly injured by the fluosilicates of sodium, potassium, and barium. The other fluosilicates damage severely the foliage of these plants. Smartweed, one of the favorite food plants of the beetle, is sensitive to fluosilicates.

6. Lime decreases the injurious action of fluosilicates on foliage but tends to destroy the toxicity of the fluosilicates.

7. Barium fluosilicate "coated" with lead oleate forms a material which is less injurious to foliage than the untreated fluosilicate. The mixture adheres to foliage and seems to be more toxic than acid lead arsenate.

Conclusions

The conclusions which may be drawn from this investigation are:

1. Fluosilicates of barium, potassium and sodium may be substituted for acid lead arsenate to kill the Japanese beetle.

2. Further work must be done with these materials to overcome their injurious action on plants and to improve their adhesion to foliage.

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THE STATUS OF THE ORIENTAL PEACH MOTH IN THE SOUTH

By Oliver I. Snapp, *in Charge, U. S. Peach Insect Laboratory, Fort Valley, Georgia*

Abstract

The Oriental peach moth (*Laspeyresia molesta* Busck) was first found in the South in the fall of 1923. Since that time inspections have revealed its presence in several localities of each of the Southern States, except South Carolina and Louisiana. Typical injury has been reported from those States. It is believed that the insect was brought into the South in infested apples. Studies of the life history and habits of the insect at Fort Valley, Ga., showed the occurrence of six generations and a

partial seventh in 1925, and five generations and a partial sixth in 1926. The use of bait pans for the control of a light infestation of the Oriental peach moth, such as occurs in Georgia, was unsatisfactory and impracticable. Neither in the past, nor at present, has the Oriental peach moth been of any economic importance in Georgia. Because of the absence of a host, to mature the broods of larvæ that hibernate, the chances are that it never will be a pest of major importance in the Georgia peach belt. The original light infestation in Georgia has shown a marked decrease during the last two years. At the present time the known infestation is confined to trees in several cities and towns, and to a part of only two commercial orchards in the peach belt.

The Oriental peach moth was not known to occur in the Southern States until the fall of 1923, when several larvæ were detected in peach twigs from the home orchard of R. M. Shaw, of Valdosta, Ga. Valdosta is about 100 miles south of the Georgia peach belt, and is in a section where very few peaches are grown. During the summer of the same year suspicious injury was observed on several peach trees in the town of Fort Valley, Ga., which is in the center of the peach belt, but no larvæ were taken for determination. During the spring of 1924 a number of larvæ were collected in twigs from these same peach trees in Fort Valley, and a determination showed that they were *Laspeyresia molesta* Busck. It is quite probable that the insect occurred at Fort Valley in 1923, the year it was found at Valdosta.

In July and August, 1924, the Federal Horticultural Board sent six inspectors into the Southern States to scout for the Oriental peach moth. From material sent in by these inspectors and by other entomological workers in the South, the insect has been determined from Raleigh, Taylorsville and Wilmington in North Carolina; Fort Valley, Macon, Thomasville and Valdosta in Georgia; Crestview, Gainesville, Jacksonville, Macclenny, Ocala, River Junction and Wildwood in Florida; Birmingham, Biluria, Mobile and Selma in A bama; Byhalia, Olive Branch and Victoria in Mississippi; Bristol, Jackson, Knoxville, Lenoir City, Memphis and Sweetwater in Tennessee; Marianna, McGehee, Osceola and Wynne in Arkansas; and Dallas in Texas. Typical injury has been reported from many other localities in these states, and from South Carolina and Louisiana. Undoubtedly the insect occurs in a number of localities in the South other than those from which definite determinations of the insect have been made.

It is believed that this insect may have been brought into the South in infested apples. The first *L. molesta* larva collected in the Georgia peach belt was taken from a peach tree in the rear of a grocery store. It was learned that decayed apples were sometimes thrown out in the rear of this store. An adult *L. molesta* was reared from a larva in an

apple that was purchased at this place. The barrel from which it came showed that this apple was shipped from a locality in the North where the insect is known to occur. Shipments of apples had been made from there to a produce dealer in Macon, Ga., and then were jobbed to merchants in a number of localities in that state. In nearly every locality in the South where the insect is known to occur, the infestation is confined to trees within or very near to the city or town limits.

The life history and habits of the insect have been studied at Fort Valley, Ga., during the last two years. In 1925, six generations and a partial seventh were reared in the insectary at that point. In 1926, there were five generations and a partial sixth reared in the insectary. In 1925, the first moth of the spring brood emerged on March 8, and the last moth of the sixth brood emerged October 25. The emergence dates of the first and the last moth of each brood in 1925 were as follows: Spring brood, March 8 and April 25; first brood, April 28 and May 28; second brood, May 29 and June 25; third brood, June 26 and July 28; fourth brood, July 20 and August 28; fifth brood, August 18 and September 28; sixth brood, September 16 and October 25. In 1926 the first moth of the spring brood emerged on March 28, and the last moth of the last brood emerged on September 27. The emergence dates of the first and the last moth of each brood in 1926 were as follows: Spring brood, March 28 and June 7; first brood, May 19 and June 29; second brood, June 18 and August 1; third brood, July 17 and August 30; fourth brood, August 14 and September 20; fifth brood, September 10 and September 27.[1] In latitudes where this insect produces six or seven broods of larvæ annually, its hosts would perhaps be subjected to severe attacks if field conditions were favorable for the rearing of each generation. Parasites of the Oriental peach moth are evidently very scarce in the Georgia peach belt. Only two parasites were reared in connection with the life-history studies in 1925, and only one in 1926.

The infestation in the several infested peach orchards in Georgia has been too light for control experiments; consequently none have been undertaken, except to test out the bait pans. These were found to have a number of disadvantages under our commercial-orchard conditions. Had the Oriental peach moth infestation been heavy the bait pans might have been found more satisfactory. Very few moths were captured in the pans which were placed in the orchard showing the heaviest

[1]The life history records were taken in the insectary by C. H. Alden and H. S. Swingle of the U. S. Peach Insect Laboratory.

infestation in Georgia. Only 39 moths were captured from 10 pans in this orchard in 1925, and only 1 in 1926. Black-strap molasses (1 to 10) was used more than any other bait. High winds in the spring caused the bait to slop over, making an unsightly mess on the leaves and twigs, and necessitating daily refilling. The slopped-over material caused slight burning of leaves and peaches. In hot weather the black-strap formed a hard, gummy mass at the top of the pan, and when in that condition the attracted insects escaped. Molasses-yeast baits caused the formation of a thick scum which allowed some of the insects to escape. The pans were fastened by nails to the larger branches. This caused slight wounds with severe gumming of injured limbs. When the pans are tied on, the string causes wounds by cutting into the bark. The method requires too much hand labor and too much supervision, especially when the pans are placed high up in the trees. Even if it were effective, it would be a costly method. The fermenting molasses corrodes aluminum vessels, such as we used, thus requiring some replacement of pans from year to year. Twig injury by *L. molesta* larvæ was noted in both 1925 and 1926 before any moths were attracted to the pans, thus indicating that the method was of little value in determining the beginning of the respective broods. It is difficult to determine in the field whether the pest is the Oriental peach moth or a similar-appearing insect, because the molasses obscures the wings and the bodies of the moths. The pans caught fully as many beneficial as harmful insects, as, for instance, aphis lions, ants, and honeybees. The pans are often difficult to take down at the end of the season, because the bark has grown around the handle. In such cases a limb wound frequently results when removing the pans. Under conditions of light infestation, such as occur in Georgia, these bait pans have proven to be of no practical value in the control of the insect.

Neither in the past, nor at present, has the Oriental peach moth been of any economic importance in Georgia. The chances are that it never will be a pest of major importance in the Georgia peach belt, unless late fruit is planted, because no host is afforded for the maturing of the three last broods of larvæ. The harvest of the latest commercial variety of peaches is usually completed in Georgia before the last three broods of the Oriental peach moth have been produced. By that time, on account of the hardened condition of the peach twigs, the larvæ have ceased to work in them. Consequently there is an apparent heavy mortality of Oriental peach moth larvæ of broods that would hibernate, owing to the absence of a host after midsummer. Dead larvæ have been found frequently in peach twigs in Georgia after peach harvest,

their death apparently having resulted from an inability to feed in the hardened twigs. In 1925, fourth-brood larvæ were making their appearance in the Georgia peach belt during the harvest of Elberta peaches, the last commercial variety to ripen in that state. No larvæ of the fourth brood hibernated in 1925. The fifth, sixth, and seventh generations were reared in the insectary after peach harvest that year, and 13 per cent of the fifth, 65 per cent of the sixth, and 100 per cent of the seventh brood larvæ hibernated. In 1926, third-brood larvæ were making their appearance in the Georgia peach belt during the harvest of the last commercial variety of peaches. No larvæ of this generation hibernated. The larvæ in hibernation at the present time are made up of individuals of the fourth, fifth, and sixth broods. Thus the broods of peach moth larvæ that hibernate in central Georgia are not produced until after the fruit has been harvested, and when the twigs have hardened. Of course a few larvæ may reach maturity late in the season in water sprouts or sucker growth of neglected trees.

The infestation has not increased in Georgia since it was first found. As a matter of fact, it has decreased. It is the opinion of the writer that this has been owing to a heavy mortality of larvæ of the broods that hibernate. At the present time the known infestation in Georgia is confined to trees in several cities and town, and to only two commercial orchards in the peach belt. One of these is a small, isolated orchard, and the other is one adjoining a town, only the part within the city limits being infested. In every case at present the infestation is very light. Not a single injured twig was found this year in five commercial orchards in Georgia, parts of which showed an infestation in 1924 or 1925.

RECENT DEVELOPMENTS IN STRAWBERRY ROOT WEEVIL CONTROL

By W. Downes, *Victoria, B. C., Canada*

Abstract

The Strawberry Root Weevil (*Brachyrinus ovatus* L.) is the most serious pest of strawberries on the Pacific Coast. The history of past efforts to arrive at a satisfactory method of control is reviewed. Previous methods suggested by different workers have been cultural methods, including suitable crop rotation and the use of weevil proof barriers. The most recent method is by the use of poisoned bait, consisting of chopped evaporated apple waste. The poisons used may be Sodium fluosilicate, Magnesium arsenate, Calcium arsenate, and Sodium fluoride. All these have been found effective but in the experimental work at Victoria, Sodium fluosilicate was found the most satisfactory. Apple waste containing approximately 20 per cent moisture was found more attractive than super dried bait and Sodium

fluosilicate was found the most suitable poison to use with waste containing that degree of moisture. A strength of 5 per cent of poison was found to give the best results. Two applications of the bait are recommended, the first in April and the second in June.

Within the past two seasons a method of control for the Strawberry Root Weevil by means of poisoned bait has come into use which bids fair to solve the very difficult problem of the control of this pest. Attempts to arrive at a satisfactory method of control have been made by various workers for more than twenty years but nothing better was suggested for many years than cultural methods and crop rotation which in most cases were only half-measures and did not overcome the danger of immediate re-infestation. The first research work of any extensive character conducted in the Pacific Coast states was carried out by the late Prof. A. L. Lovett at Corvallis in 1912 and in the same year by the late R. C. Treherne at Hatzic in the Fraser Valley. The result of these investigations was simply to confirm the opinion of previous workers as to the desirability of proper crop rotation to avoid a concentration of the pest. Further work was carried on by the writer at Victoria, B. C., in 1918 and subsequent years in an attempt to solve the problem of artificial control. In this work the life-history of the weevil was still further elucidated and many trials were made of weevil-proof barriers in an endeavour to keep the insects out of the fields altogether. These methods proved more or less effective but had many objectionable features and did not prove sufficiently practical.

About four years ago Mr. M. J. Forsell, while working upon weevil control in the State of Washington, discovered that the adults were attracted by evaporated apples and a poisoned bait was devised, using evaporated apple waste as a carrier. In this bait magnesium arsenate was the poison used and the manufacture of the bait has now been placed on a commercial basis. In 1925 Melander and Spuler at Pullman, Wash.,[1] conducted experimental work with a view to determining whether the bait could be improved and cheapened. In these tests various attractants, principally essential oils, were tried with negative or inconclusive results and none were found superior to apple waste alone. Of the poisons used, magnesium arsenate, calcium arsenate and sodium fluoride were found effective in the order named.

During the past two seasons the writer has done considerable experimental work along similar lines at Victoria, B. C. In 1925 the experiments were of short duration but served to show that apple used alone was superior to various mixtures tried. In 1926 the experimental

[1]Melander, A. L., and Spuler A., Wash. Agr. Exp. Sta. Bul. 199. 1926.

work was confined to the use of evaporated apple waste as a carrier and the poisons used were sodium fluosilicate, magnesium arsenate, calcium arsenate and sodium fluoride. All these gave good results but sodium fluosilicate gave the best results during the entire season having regard to killing properties and the physical nature of the mixed bait. Sodium fluosilicate also has an advantage over magnesium arsenate in being cheaper.

In the manufacture of a commercial bait consideration has to be given to the behaviour of the bait under storage conditions. Ordinary evaporated apple waste contains from 20 to 24 per cent moisture and when such waste is chopped and mixed with magnesium arsenate or calcium arsenate, the resulting bait under the humid conditions of the coastal districts rapidly becomes so sticky as to be unusable. For this reason commercial bait is super dried to contain about 12 per cent moisture. When so dried it can be crushed instead of chopped and when mixed with magnesium arsenate does not become sticky. But the super drying deprives it of a certain amount of attractiveness and in our tests at Victoria the home made, freshly chopped bait, containing approximately 20 per cent moisture was found superior in nearly every test.

The use of sodium fluosilicate provides us with a poison bait that is not hygroscopic and at the same time possesses the maximum attractiveness. A heavy grade of sodium fluosilicate was used at the same strength as the other poisons tried, namely 5 per cent. The use of a fluoride compound also does away with the prevalent objection to using arsenates round about fruit that is shortly to be picked. A strength of 2½ per cent was found to be uncertain in its results. As regards the carrier, any form of apple waste, including fresh pomace, may be used when evaporated to 20 per cent moisture content. In our experimental work it was chopped by being put through an ordinary kitchen food chopper. And here lies the chief difficulty of preparing this bait under commercial conditions. Evaporated waste containing such an amount of moisture is so sticky and tough to cut that choppers rapidly become hot when run by power. We tried several types of vegetable cutters but they either became gummed up with the material or failed to cut it at all. Doubtless this difficulty will be surmounted in time by the production of a suitable machine. The difficulty has been got over by experimenters in Washington State by super drying the apple waste, which can then be crushed under rollers, but in our experience it then loses much of its attractiveness. The following are the summarized comparative results

of the baits used in field tests this summer at Victoria from June 2nd to July 6th:—

5 per cent	Sodium fluosilicate	93.3 per cent kill
	Magnesium arsenate	94.2 per cent kill
	Calcium arsenate	91.9 per cent kill
	Commercial bait	80.4 per cent kill

Sodium fluoride was used in one test only and gave a kill of 94.5 per cent as compared with sodium fluosilicate which gave a kill of 94.91 per cent. It is only fair to state that in some trials the commercial bait gave very good results. In April an application of commercial bait was made outside a weevil proof barrier where weevils were numerous, wandering up and down trying to cross, and a kill of over 90 per cent was obtained. On the other hand the kill with commercial bait was in some of our tests as low as 57 per cent. The weevils take the bait readily from the time they come out of hibernation until the middle of July in the coastal districts. After this period they feed less readily and the kills we obtained in our trials at that time were unsatisfactory. In interior districts, however, their development is less advanced and at Armstrong, B. C. on Aug. 11th kills were obtained, using calcium arsenate with evaporated waste and fresh evaporated pomace, of 89.4 and 93.5 per cent.

Having regard to the life-history of the weevil, it is apparent that two applications of the bait should be made, the first in April to destroy the overwintered adults and the second in June for the summer brood of weevils which emerge from the soil about that time. From 50 to 100 lbs. of bait is required per acre and it is applied by dropping a small handful down among the crown of the plants. In the writer's opinion success in keeping fields free from weevil will depend upon the time the bait is applied. This should be done if possible before any eggs are laid. When the mechanical difficulties of making the bait are overcome it appears as though this method of control will prove the simplest and most satisfactory yet devised, but the method has not yet been long enough in use to enable us to tell to what extent the fields will remain free from the pest. In all probability the necessity for proper crop rotation will remain, as in the past.

CHEMICAL TREATMENT OF BANDS AS A SUPPLEMENTAL CONTROL MEASURE FOR THE CODLING MOTH

By E. H. SIEGLER, *Assoc. Ent.;* LUTHER BROWN, *Asst. Ent.;* A. J. ACKERMAN, *Assoc. Ent.;* E. J. NEWCOMER, *Assoc. Ent.; Bureau of Entomology, United States Department of Agriculture.*[1]

ABSTRACT

As a result of preliminary tests, it is believed that bands employed as cocooning traps for codling moth, *Carpocapsa pomonella* L., larvae may be treated with a chemical toxic to the larvae. By use of a suitable chemical the necessity of removing and destroying, at regular intervals, the larvae that cocoon beneath the bands, may be obviated. In this connection, beta-naphthol and an oil emulsion have each given some promise.

Satisfactory control of the codling moth, *Carpocapsa pomonella* (L.), has not been obtained consistently in several of the important apple-growing regions. This is true particularly in many of the Central and Western States; and, under weather conditions favorable to the insect, serious outbreaks may occur here and there in the Eastern States.

Since, by present spraying practices, only a part of the surface of the fruit is covered with poison, the chances of a satisfactory kill are better where there is an average of 5 larvae attacking an apple during the season than where 25 attempt to enter. This ratio of codling moth population between the several orchard districts exists and accounts in a large degree for differences in success of control. While the writers believe at this time that proper spraying is by far the most practical means of control, they realize that efficient auxiliary methods, including general orchard sanitation with respect to packing houses and field boxes, would be desirable in regions where the codling moth is abundant. Many measures employed with the purpose of augmenting the spray practice have been used, such as (1) destruction of the mature larvae after they have left the fruit, (a) by scraping the loose bark from the trunk of the tree, (b) by killing the larvae that spin beneath bands applied to tree trunks; (2) destruction of the moths, (a) by light traps, (b) by wire-screen band traps, (c) by bait pan traps.

Generally speaking, supplemental control practices have not been popular and doubtless never will be employed extensively until their value has been established. This is somewhat difficult to ascertain under field conditions because of moth migration in the experimental plats.

[1]This work is being conducted at the field stations of the Division of Deciduous Fruit Insect Investigations located at Silver Spring, Md.; Bentonville, Ark.; and Yakima, Wash.

In the present paper on the chemical treatment of bands, the writers wish merely to present an idea with the hope that other entomologists interested in the subject may have opportunity to develop it further.

It is believed that a band of cloth may be impregnated with a chemical which will kill the larvae that spin between the band and the tree trunk. If a non-repelling chemical, toxic to the insect and non-injurious to the tree, can be found for this purpose, then the labor involved in destroying the larvae cocooned beneath bands will be obviated.

A few preliminary experiments have shown that a liberal application of beta-naphthol[2] (technical grade) to cloth bands killed the larvae that cocooned in contact with this material. The action was relatively slow, requiring from two to three weeks. These experiments were started rather late in the season of 1926, and although the prevalence of rain during the period of trial destroyed much of their value, sufficient evidence was obtained to indicate some promise. It was realized that this treatment would not be effective unless the chemical would resist the washing away by rain. To accomplish this end, it seemed feasible to make a waterproof mixture by means of the addition of lubricating oil to the beta-naphthol powder. This combination was made in the below proportions:

Beta-naphthol, tech'l	1 pound.
Lubricating oil (red engine type)	1 1/3 pints.

The above mixture has a consistency of paint of medium thickness and may be applied readily to a cheese-cloth band by means of a broad paint brush. The band should then be folded over once and may be run through a clothes wringer to insure saturation of the cloth and remove excess material. The above formula will provide sufficient material for 80 to 90 bands, each 3 feet in length and 4 inches in width when folded, at a cost of about ⅓ cent per band. These bands may be made in rolls and cut to any desired length at the time they are tacked to the tree trunk.

Since the full grown codling moth larvae are negatively phototropic,[3] they prefer to spin beneath dark colored materials. It is therefore believed that it would be desirable to dye the cheese-cloth black or else mix in a quantity of lamp black sufficient to accomplish the same end.

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[2]Beta-naphthol, $C_{10}H_7OH$, is a light, fairly fluffy chemical in the form of minute scales; it is very slightly soluble in cold water and vaporizes rather slowly at summer temperatures.

[3]Bul. No. 932, U. S. Dept. of Agr. Life History of the Codling Moth in the Grand Valley of Colorado by E. H. Siegler and H. K. Plank.

With cheese-cloth at 7 to 8 cents per square yard, the total cost of the above described band, including chemical and dye compound, is about 2 ⅓ cents.

The questions of the repelling effect of chemically treated bands and possible injury to the tree have not been carefully studied. Apparently, however, beta-naphthol is not a strong repellent nor is it injurious to the tree.

After further studies have been made along this line, other chemicals may be found that will work to even better advantage than beta-naphthol. A commercial brand of emulsion, containing a refined white oil (85 per cent oil) of which 95 per cent was unsulphonated residue, was employed in a test and with promising results. This emulsion was used at full strength on a burlap band.

It is planned to make further investigations along this line at several of the field stations of the Bureau of Entomology during the season of 1927.

PRELIMINARY EXPERIMENTS IN THE APPLICATION OF PARADICHLOROBENZENE IN LIQUID FORM AGAINST THE PEACH TREE BORER

By E. H. SIEGLER, *Associate Entomologist*, and LUTHER BROWN, *Assistant Entomologist, Deciduous Fruit Insect Investigations, Bureau of Entomology, United States Department of Agriculture*

ABSTRACT

Paradichlorobenzene dissolved in high test gasoline and applied in liquid form around the base of the peach tree has been tested against the peach-tree borer, *Aegeria exitiosa* Say. Results of preliminary experiments have indicated that this chemical in solution was effective as a control measure.

Preliminary experiments conducted during the fall of 1926 have indicated that a solution of paradichlorobenzene may possibly be used for the control of the peach-tree borer, *Aegeria exitiosa* Say.

Several tests on a small scale involving dosages of ¾ ounce and 1 ounce of the chemical in solution in comparison with the same amounts of the insecticide in crystalline form, were made on six-year-old peach trees on October 13, 1926, and examination of the results made on December 1, 1926. Tests were also made along other lines with special reference to possible saving of labor.

The crystals of paradichlorobenzene were dissolved in high-test gasoline which was used at the rate of 50 c. c. to each ounce of the crystals. The resulting solution was applied in a circle around the base of the tree by means of a small separatory funnel, the circle of liquid being about two inches distant from the trunk. This apparatus was

fairly convenient to use since the rate of flow was readily controlled by proper regulation of the stop-cock. In the application of the solution no attempt was made to remove debris from the base of the tree nor was the surface crust of the soil disturbed. The crystals of paradichlorobenzene were applied after the manner recommended by the Federal Bureau of Entomology.

The results of one test are given in Table 1, in which 1 ounce of the crystals was used in comparison with a solution containing a like amount of paradichlorobenzene. The results of the remaining tests will be noted during the spring of 1927.

TABLE 1.—COMPARATIVE RESULTS AGAINST THE PEACH TREE BORER OF APPLICATIONS OF PARADICHLOROBENZENE CRYSTALS AND OF A SOLUTION OF PARADICHLOROBENZENE IN GASOLINE (1 OUNCE IN 50 CC.)

Tree No.	Paradichlorobenzene, 1 ounce				Check (Untreated)	
	Crystals		Solution			
	Larvae alive	Larvae dead*	Larvae alive	Larvae dead*	Larvae alive	Larvae dead
1	0	0	0	5	6	0
2	0	1	0	0	3	0
3	0	3	0	4	3	0
4	0	2	0	0	6	0
5	0	0	0	1	4	0
6	–	–	0	0	4	0
7	–	–	1	0	2	0
8	–	–	0	2	5	0
Total	0	6	1	12	33	0
Average per tree	0	1.20	0.12	1.50	4.12	0

*Several of the larvae found dead were decomposed.

In using a solution of paradichlorobenzene a somewhat different set of conditions is confronted than when the original crystalline form is applied. Upon evaporation of the solvent the paradichlorobenzene recrystallizes in a very finely divided state and is distributed in part below the surface of the soil. Further experiments will be made to determine what advantages or disadvantages a solution of the chemical may have as a control measure for the peach tree borer.

MOTH BORER DAMAGE TO DIFFERENT VARIETIES OF SUGAR CANE

By T. E. Holloway and W. E. Haley, *Bureau of Entomology, U. S. Department of Agriculture*

Abstract

To combat diseases and other troubles in the sugar cane fields of Louisiana varieties of cane from Java were recommended, and these were said to be resistant to the sugar cane moth borer. Field examinations indicate that they are not resistant. Nevertheless, their habit of long stubbling may reduce borer damage by reducing the number of hibernating larvae in planted seed cane. The situation is, however, complicated by other factors, as the extensive planting of corn, which is the favorite food plant.

As a foreword, it is necessary to explain to entomologists that the Louisiana sugar industry has steadily declined for a number of years until it has reached a precarious position. Some of the sugar planters have already been forced out of the business, and it is estimated that of those still operating about fifty per cent will be obliged to sell their holdings or go into bankruptcy.

There are several explanations for this condition. The planters have been farmers who were interested in finances and mechanics instead of in agriculture. As they have admitted, the farming has been left to poorly educated overseers in charge of gangs of negroes, while the owners have concerned themselves with the operation of the sugar factories and with the marketing of the crop. Diseases have been allowed to become widespread. Little or no effort has been made to fight insect pests. Soil improvement has been a very secondary matter. While the World War with its high prices put the planters on their feet temporarily, it merely delayed their downfall, and they are now paying dearly for their previous indifference to things agricultural.

Within the last two years new varieties of cane from Java have been advocated as a cure-all for these various troubles. These canes are indeed resistant or tolerant to the diseases, but in the opinion of the writers their planting should be accompanied with soil improvement work, insect control, and other advanced farm practices.

Among other claims made for the new "P. O. J." canes (so called for the Dutch words for "Experiment Station of Java") was that they were resistant to the sugar cane moth borer, *Diatraea saccharalis* Fab. Reports coming from Argentina, which of all sugar cane countries has a climate most like that of Louisiana, stated that with the general planting of the Java canes the moth borer had ceased to be a problem. To the writers it seemed that if the borer had ceased to be a pest it was not due so much to any resistance of the new varieties themselves as to another

cause. They explained it as follows: The new varieties have given a number of "stubble" crops in Argentina as against one or two stubble crops of the old varieties. This means that less and less cane is planted and more and more springs up year after year from the stubble. Now, it has been found that a dangerous source of borer infestation is in the planted stalks, the borer larvae developing in the stalks and the issuing adults making their way through the slight covering of soil, ready to oviposit on plants of the grass family. Thus, the less cane there was planted, the fewer borers were planted in the stalks, and as more and more of the long-stubbling Java varieties were planted the numbers of hibernating larvae were progressively reduced.

By cooperation with the Office of Sugar Plant Investigations, Bureau of Plant Industry, U. S. Department of Agriculture, the writers have been able to make status examinations of a number of experimental plots of the new varieties, together with two old varieties, "D. 74" and "Louisiana Purple." The results are given in the following table.

Variety	At U. S. Field Sta., Houma, La.		At Abby-Highland Plantation, Thibodaux, La.		At P. R. Landry's Plantation, Lafayette, La.		Average percentage of stalks bored
	Number of stalks bored per 100	Number of joints bored per stalk	Number of stalks bored per 100	Number of joints bored per stalk	Number of stalks bored per 100	Number of joints bored per stalk	
POJ 826	36	2	54	2	62	2	
	43	2	42	3	48	2	47
POJ 36	36	2	30	1	32	1	
	40	3	30	1	58	2	37
POJ 234	44	3	34	1	88	2	
	54	3	58	3	80	2	59
POJ 213	72	3	96	4	96	2	
	74	5	98	4	98	4	89
D 74	62	3	54	3	—	—	
	44	2	64	3	—	—	56
La. Purple	—	—	—	—	86	2	
	—	—	—	—	92	2	89

The writers were also able to obtain some figures from the large fields at Southdown Plantation, Houma, La., and these are published by courtesy of the H. C. Minor Estate. P. O. J. 213 was 86% infested, with about 2 joints bored per stalk, while P. O. J. 36 was 73% infested, with about the same joint damage. P. O. J. 234 was 68% infested, with from 2 to 3 joints bored per stalk. P. O. J. 213 is therefore high in borer injury, though not as high as in the variety plots, while P. O. J. 36 and P. O. J. 234 are higher in the large fields than might have been expected from their results in the variety plots.

It appears from these results that the new varieties are not borer-resistant by any means, but that P. O. J. 213, on the other hand, is rather attractive to borers. Nevertheless, the extensive planting of these new canes, which is now going on in Louisiana, may have the effect of reducing borer injury if they grow from stubble for a long time as they are reported to do in Argentina. There is some question as to whether this will be the case. At the same time, the situation is complicated by other features, as for instance the extensive planting of corn on Louisiana sugar plantations, corn being the favorite food plant of the moth borer and often producing borers by the hundreds and thousands which in midsummer go over as moths to the adjoining sugar cane fields.

STATUS AND DISTRIBUTION OF SEVERAL IMPORTED INSECT PESTS IN PENNSYLVANIA

By C. H. HADLEY

ABSTRACT

Several major imported insect pests have in recent years been found in Pennsylvania, including the Japanese beetle (*Popillia japonica* Newm.), the European corn borer (*Pyrausta nubilalis* Hubn.), the Mexican bean beetle (*Epilachna corrupta* Muls.), and the Oriental fruit moth (*Laspeyresia molesta* Busck). Each of these species is apparently slowly spreading and increasing in economic importance. Two other species, the imported Willow leaf beetle (*Plagiodera versicolora* Laich) and the Apple and thorn skeletonizer (*Hemerophila pariana* Clerck), have both been found but have not as yet assumed a position of major economic importance.

Within the past few years several insect pests have been found in Pennsylvania, which have not hitherto been known to occur within the state. It seems likely that their original method of introduction into the state was largely through the movement of host plants, the type of movement which is not susceptible to control in a manner which will prevent the introduction of the insect concerned.

THE JAPANESE BEETLE (*Popillia japonica* Newm.)

Although the Japanese beetle was first discovered in New Jersey in 1916, it was not found in Pennsylvania until the summer of 1920, when it was found just across the Delaware River from the main infestation in New Jersey. The spread since that time has been rather uniform as to direction, and along lines which would naturally be expected and represents, it is believed, what may be expected in the way of yearly spread of this insect. At the present time it is distributed over that portion of southeastern Pennsylvania lying south of the first mountain range of the Allegheny chain, as far west as the Susquehanna River.

The territory involved comprises approximately 5325 square miles, which is 12 per cent of the total area of the state.

From the point where the insect was first found in Pennsylvania in 1920 to the farthest distant point where beetles were found during the past summer is almost exactly 100 miles in an airline distance, giving therefore an average annual rate of spread air line of about 15 miles per year.

The Japanese beetle is recognized as a pest of major importance to the agricultural crops in general, and particularly to fruit and shade trees.

European Corn Borer (*Pyrausta nubilalis* Hubn.)

The European corn borer was first found in the extreme northwestern corner of Pennsylvania in Erie County, in the early fall of 1919. It is thought that the infestation originated either in infested plant material drifting in the waters of Lake Erie, or possibly from the flight of moths from the early Ontario infestation. From 1919 to 1923 inclusive, the spread of the corn borer in northwestern Pennsylvania was relatively slow. However, since 1924 the spread has been both rapid and extensive, so that at the present time practically one-half the state is known to be infested. However, the area of general infestation is still limited to the northwestern corner of the state. Of the 67 counties of the state 30 are included in the territory quarantined for the corn borer, comprising approximately 24,000 square miles, or 54 per cent of the total area of the state.

Beyond any reasonable doubt the European corn borer may be considered as the outstanding agricultural insect pest, since it is a major pest of corn, and the corn crop is always the basis of agricultural production of all kinds.

Mexican Bean Beetle, (*Epilachna corrupta* Muls.)

The Mexican bean beetle is probably a very recent introduction into the state, having been found first in 1924 in the extreme southwestern corner of the state with a very limited distribution. The insect spread rather generally from its original source of infestation in 1925 in a fairly uniform direction. During the season just past the insect was found at isolated points some little distance from the previous year's infestation, but in several cases at least the point of finding this past season seems to be quite remote from the more generally infested area. However, since no extensive careful scouting was carried on over the territory as a whole, it is quite probable that the insect is more generally distributed, at least in the western and southwestern portions of the state than our records to date indicate. The outlying points of infestation are Venango County, Bedford County and Dauphin County.

The Mexican bean beetle to date has not caused any serious damage to any agricultural crop. During the summer of 1926, however, it did seriously reduce, and in a number of cases in the older infested territories, completely destroyed garden beans. All kinds of garden beans seem to be very susceptible to attack, and the outlook seems to be that this insect will be primarily a pest of garden beans.

The Oriental Fruit Moth (*Laspeyresia molesta* Busck)

The Oriental fruit moth was first noticed in Pennsylvania in numbers sufficient to cause loss in 1923, although it is quite probable that the insect actually occurred in a very limited way as early as 1919. At the present time practically every commercial peach growing section in the state is infested by this insect, it having been found in practically all the southern peach growing counties, in the vicinity of Pittsburgh, and in Erie County in the extreme northwestern corner of the state. No general survey has been made to determine definitely the presence or absence of this pest throughout the state as a whole, but it is probably safe to say that it occurs practically all over the state where peaches are grown. No attempt has been made to limit the distribution of this pest through quarantine measures, since in view of the fact that it is probably distributed largely in infested fruits originating not only in Pennsylvania but in other states to the southward, effective quarantine enforcement would be extremely difficult, if not entirely impossible, on account of the very general and extensive movement of peaches.

It is an outstanding pest of peaches and quinces especially, and also has been known to attack apples in some cases to a very considerable extent. Probably it is the outstanding peach pest of the present day, and as yet no really satisfactory measures of control have been developed. There is also some reason to believe that it may become a major pest of apple under some conditions.

Imported Willow Leaf-Beetle (*Plagiodera versicolora* Laich)

This European leaf-beetle attacking chiefly willows and poplar, is a rather recent introduction. It has been known to occur in the vicinity of Philadelphia for the past several years, having been noted by our nursery inspectors during the course of their regular inspection of nurseries for the first time in 1923. However, it had not been found beyond the immediate vicinity of Philadelphia prior to the summer of 1926, when it was found fairly abundant and doing considerable feeding on willows along the edge of the Susquehanna River in Harrisburg, approximately 90 to 100 miles distant from the infested sections around Philadelphia. While no general scouting has been carried on to

determine its presence elsewhere, it seems reasonably safe to assume that its spread from the westward and northward from the Philadelphia section has been rather slow, and probably does not occur to any extent beyond the territory mentioned.

While we have observed it to be feeding in comparatively large numbers and very extensively on willows, it can hardly be considered, as yet at least, as an important pest of either willows or poplars.

APPLE AND THORN SKELETONIZER (*Hemerophila pariana* (Clerck)

This European species first reported by Doctor Felt in 1917 had not been noted in Pennsylvania, as being of any consequence at least, prior to the summer of 1926. During the past summer it was found quite general in Wayne, Pike and Monroe Counties in the extreme northeastern corner of the state. A survey through this area showed it to be almost universally present on unsprayed apple trees, and causing very extensive, and in some cases complete defoliation. The fact, however, that it was found very largely on unsprayed apple trees, and seldom if ever on the trees that had received any reasonable amount of protection through arsenical sprays, would indicate that it should not be considered as a pest of major importance.

OBSERVATIONS ON THE LIFE HISTORY, HABITS AND CONTROL OF THE NARCISSUS BULB FLY, *MERODON EQUESTRIS* FAB., IN OREGON

By JOSEPH WILCOX and DON C. MOTE, *Oregon Agricultural Experiment Station*

ABSTRACT

The Narcissus Bulb Fly, *Merodon equestris* Fab., has been introduced into Oregon from Europe and has established itself in the commercial plantings of Narcissus. In one planting 14 per cent of the bulbs were destroyed by this pest.

Our observations to date show the seasonal history of this pest to be as follows: Winter is passed as full grown larvae in the bulbs. In March and the early part of April the larvae leave the bulbs usually through the neck and pupate in the soil, about ½ inch deep. The flies emerge mainly in April, but can be found in the fields until in June. Egg laying takes place in the latter part of April and in May. The majority of the eggs hatch in from 8 to 10 days and the young larvae enter the bulb usually through the basal plate. The larvae are full grown by September.

The injury by this insect is characteristic. The center of the bulb is eaten out and partly filled with brown excrement. Infested bulbs are not easily detected, and may be as hard and solid as uninfested bulbs.

All larvae in the bulbs can be killed by the Hot Water Treatment as applied for the Stem Nematode, *Tylenchus dipsaci* Kuehn. This treatment is not a cure-all, however, as it is impossible to remove all the bulbs from the soil when digging. Tests with ovicides made in the spring of 1926 were promising; 100 per cent control was obtained with corrosive sublimate.

The Narcissus Bulb Fly, *Merodon equestris* Fab., is one of the most serious insect pests of Narcissus both in this country and in Europe. This insect has been introduced into Oregon and now threatens the commercial Narcissus bulb industry, the plantings of which totalled close to 8 million bulbs in 1925 and are to be increased this season. A survey of the Narcissus plantings made in the spring of 1926 shows this insect to be established in practically all of the commercial plantings. In one planting 14 per cent of the bulbs have been destroyed by this pest in stock that has been grown only one year.

As there was little known of this insect in this country and especially in Oregon, it was found necessary to make a study of its life history, habits, and control under Oregon conditions. This study was started in 1925 and has been continued up to the present date. Practically all of the observations were made in several of the commercial plantings under field conditions.

Seasonal History

Observations to date show the seasonal history of this pest to be as follows: The winter is passed as full grown larvae in the bulbs. In March and the early part of April, the larvae leave the bulbs usually through the neck and pupate in the soil about ½ inch deep. The flies emerge mainly in April but can be found in the fields until in June. Egg laying takes place in the latter part of April and in May. The majority of the eggs hatch in from 8 to 10 days and the young larvae enter the bulbs usually through the basal plate. The larvae are full grown by fall. One generation is produced each year.

Life History and Habits

The Eggs are chalk white in color, oval in shape, and 1.6 mm long by .6 mm wide. Practically all the eggs are laid in the soil about the base of the plants. More than 400 eggs have been gathered in the fields, and in every case except one they were found in the soil. In the one exception the egg was deposited on a leaf about ½ inch above the soil. A number of flies have been observed while ovipositing and in no case was there an attempt to lay the eggs anywhere except in the soil. The position in the soil is usually about ⅛ inch deep and from ¼ to ¾ inch away from the plant. They are generally found attached to the under side of a small clod of dirt. Usually only a single egg is found to the plant but as high as four have been taken in the field.

Egg laying takes place in the latter part of April and in May. The first date on which eggs were found in the field was April 19, and the last date on which unhatched eggs were observed in the field was May 21.

The eggs hatch in from 6 to 15 days. Of the 43 eggs of which we have a record, 72 per cent hatched in from 8 to 10 days.

THE LARVAE or "grubs" when newly hatched are 1.8 mm long and are white in color. The short black posterior respiratory process is characteristic of the newly hatched as well as the full grown larvae. When full grown the larvae measure nearly ¾ inch in length, are quite robust and are a dirty yellowish color.

The newly hatched larvae in most cases enter the bulb through the basal plate but in a few cases they enter through the side at the neck or base. That this is the logical place for the larvae to enter the bulb can be gathered from the fact that the eggs are laid in the soil and the only part of the bulb that is not protected by several layers of hard tough skin is the basal plate.

The growth of the larvae is quite rapid. In June they are from ¼ to ⅜ inch in length; in the latter part of July they are ½ inch in length and by the middle of September they are practically full grown. The larval stage extends from May to March or a period of 10 months.

THE PUPARIA are from a light to dark brown color depending more or less on the type of soil in which they are found. Puparia taken from a planting in Red Hill soil were a brick red color. They are ½ inch long and have the short black posterior respiratory process and the two horn like anterior spiracles prominent.

The larvae leave the bulb usually through the neck but sometimes through the base and migrate into the upper inch of soil to pupate. The majority of the puparia were found in a horizontal position in the soil about ½ inch deep or just under the surface crust.

Pupation begins early in March and continues into April. Larvae were found in the soil evidently preparing to pupate on April 7. The first puparium was found April 13 and the last larva April 7. The length of the pupal stage varies from 18 to 34 days. The average length is 30 days. In a record of which there is some doubt, the duration of the pupal stage was 45 days.

THE FLIES are about ½ inch long and resemble a small bumble bee both in appearance and habits. The body is covered with hairs and they vary from entirely black to entirely orange. The four varieties described by Verrall[1] and an additional variety have been recognized in Oregon.

In an outdoor cage the flies emerged over a period of about a month. The first fly emerged March 27 and the last flies April 29. Records

[1]Verrall, G. H. (1901) British Flies, Vol. VIII, Platypezidae, Pipunculidae, and Syrphidae. pp. 555–560. Pub. by Gurney & Jackson: London.

kept in one cage showed that the males were the first to emerge and were closely followed by the females. These emergence records are: April 12—1 ♂; April 15—7 ♂; 3 ♀; April 19—3 ♂; 6 ♀; and April 22—1 ♂; 4 ♀. The peak of the emergence was between the 10th and 20th of April; 9 flies emerged between March 27th and April 10th; 25 flies emerged between April 10th and 20th; and 8 flies emerged between April 20 and April 29th.

As the spring of 1926 was an early season, the emergence of the flies may be expected later than the above dates in normal years. Laboratory observations showed that the time of emergence of the flies was regulated by temperature as early emergence was obtained in the laboratory. The warm (70°F.) dry laboratory conditions were not favorable to the development of the flies, however, as out of numerous infested bulbs only the following flies were obtained: 1—Nov. 19; 1—Dec. 14; 1—Jan. 20; 1—Feb. 1; 1—Feb. 10; 2—Feb. 16; and 1—Feb. 17.

In flight the flies make a deep humming noise that is very similar to that of a bumble bee. This noise is evidently produced by the vibration of the wings in flight. The males fly quickly from place to place and usually rest on the tips of the leaves. At rest the males hold their wings at an angle of about 45° with their bodies. The females fly close to the ground and light on the leaves near the base. They frequently fold their wings together when at rest.

On cool and cloudy days the flies cannot be found in the fields, and are evidently away from the field feeding on flowers as they have been observed to be covered with pollen. For example on May 10 the morning was cloudy and no flies were seen in the field. At 10 o'clock the sun came out bright, and in a short time the flies appeared in large numbers and could easily be seen flying in and about the daffodils.

Copulation. In only two instances have we noted the flies in copulation and in both cases the flies were at rest. The process was described in our notes as follows: "The male lights on the back of the female with his first pair of legs clasped on the forepart of her thorax, behind her head. He rapidly vibrates his wings all the while. After remaining there for half a minute he quickly moves back on her body so that his legs are clasped around her abdomen and the wing vibration stops. In a very short time their copulatory appendages are engaged and he begins to move his abdomen backward and forward rapidly. The female has her wings only as far apart as necessary or at an angle of about 30° with her body. In about one-half a minute the male begins to vibrate his wings and to make a high pitched buzzing note (there is no

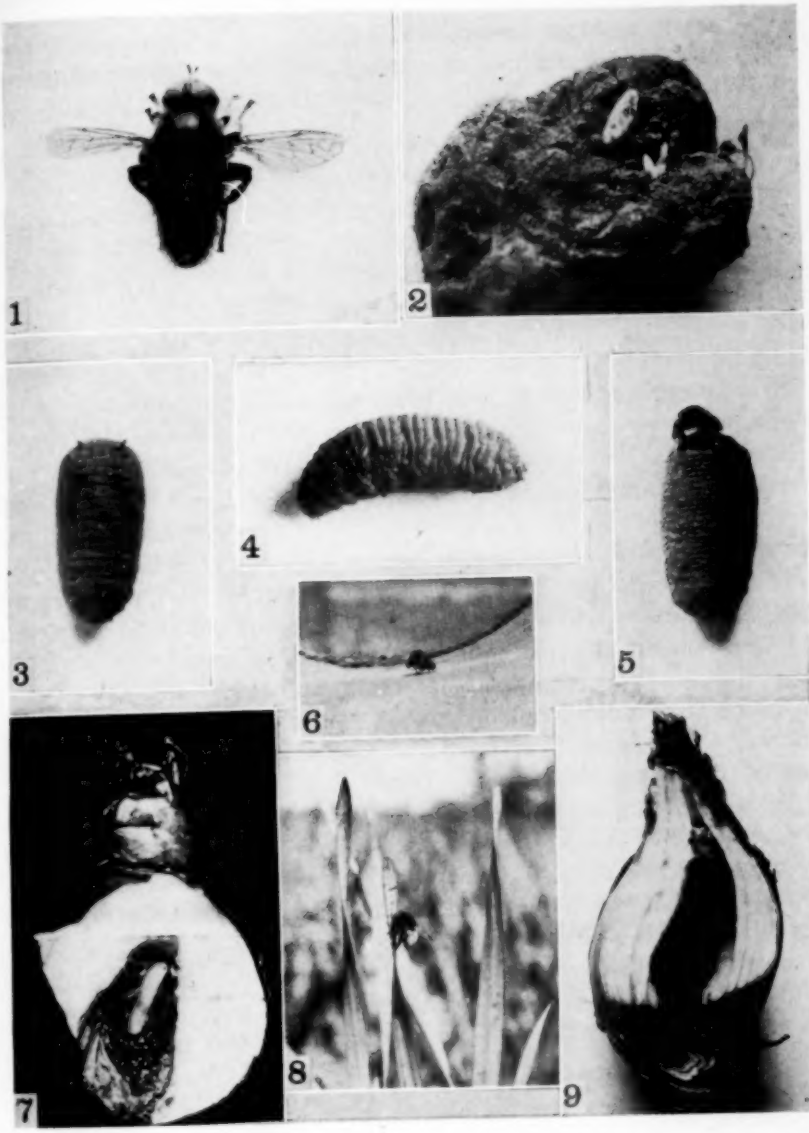
deep humming noise at this time). This continued for about 5 minutes until the flies separated. After a few minute's rest they copulated again, and in the course of an hour's time they were noted to successfully copulate 3 times and the male was unsuccessful in mounting the female on at least 3 other occasions."

The high pitched buzzing note made by the male is quite shrill and distinctive and seems to only be produced when attempting to copulate, while copulating, or when closely confined. It was determined by close observation that this note is produced only when the halteres are in rapid vibration; the wings at this time may either be in motion or at rest.

OVIPOSITION was observed a number of times and only in the middle of the day when the sun was shining. The female fly lights on a daffodil plant about 5 inches from the ground and descends the leaf with her head pointed down and usually with her wings folded. Her ovipositor is partly extended and on reaching the ground she completely extends her ovipositor. She nervously moves about the base of the plant, working her abdomen up and down and probing in various places, evidently searching for a suitable place to deposit her eggs. From one to two minutes may be spent in this searching process. When a suitable place is found, usually under a small clod of dirt adjacent to the plant, she becomes perfectly still and the egg passes out in from 20 to 30 seconds. Immediately she leaves and flies upward and usually hovers in the air 4 or 5 inches from the ground for a moment before flying to another plant to deposit another egg.

In some cases the fly rests between egg laying and diligently cleans her wings, the top of her thorax and the sides of her abdomen with her hind legs, and then rubs her tarsi together to clean these. She also cleans the side of her proboscis and face with her front legs. However, usually she flies from one plant to another and lays her eggs in rapid succession. They are evidently capable of laying a number of eggs in a short time as is illustrated by the following incident. At 12 o'clock, May 10, a female fly was captured in the field and confined in a cage over several plants. On the following day at 4 P. M. or 28 hours later, the cage was examined and the fly found dead. However, around the plants were gathered 56 eggs laid by this fly and there were no doubt others as they were difficult to recover from the soil.

The flies evidently prefer to lay their eggs in the shade, which accounts for the fact that most of the eggs are found in the soil on the north side of the plants. This has been observed in the field and is also illustrated by the following incident. Several flies were confined in a cage



1. Male Narcissus Bulb Fly; 2. Egg of Narcissus Bulb Fly (above) and three eggs of the Lesser Bulb Fly (below) as deposited on a clod of dirt; 3. Puparium, dorsal view; 4. Larvae, lateral view; 5. Dorsal view of puparium after fly has emerged, 6. Flies in copalation: 7. Dead larva and bulb mites in bulb given hot water treatment. Larva about ½ grown; 8. Male fly at rest on the tip of a Narcissus leaf; 9. Bulb showing typical injury; the full grown larvae have worked well up into the nose of the bulb.

over three plants in the field; when examined for eggs, the plant on the sunny side produced no eggs; the plant in the middle produced 5 eggs, and the last plant produced 7 eggs.

Injury

The injury caused by this insect is very characteristic. The center of the bulb is usually hollowed out and the flower bud consumed. The area around the larva is usually hollow but the remainder of the cavity is filled with excrement which is of a brownish color and resembles peanut butter both in color and physical makeup. Infested bulbs are worthless as usually they will not grow and when they do grow they produce only a weak leaf growth and no flower. The flower bud is not always destroyed but this is the usual case. Sometimes the splits may be attacked and the mother bulb free from infestation but it is usually vice versa. The bulb thus injured may produce a few small splits in a year's time but the bulb usually rots or is destroyed by mites, lesser fly, or fungus diseases.

Infested bulbs in the field are usually easily detected. All vacant spaces in the beds or rows should be regarded with suspicion and examined. When the bulbs do grow the leaf growth is spindly and yellowed. In one case an infested bulb was noted to blossom but the flower was wrinkled and did not open.

Contrary to common belief, the writers have not found it easy to detect infested bulbs after they have been dug. Large bulbs that are infested may be as hard and sound as uninfested bulbs. Numerous smaller bulbs have been destroyed by taking it for granted that they were infested because they gave under pressure of the fingers. The best method of determining whether a bulb is infested or not is to carefully examine the basal plate. Bulbs that have the basal plate sunken and corky are likely to be infested and a little scraping with a knife will reveal the entrance place of the larvae. Where entrance is made in some place other than the basal plate the bulbs can easily be detected as usually the hole is open and not plugged with the corky frass.

Control

The Hot Water Treatment as applied for the stem Nematode, *Tylenchus dipsaci* Kuehn, will kill all the larvae present in the bulbs. This treatment is not a cure-all, however, as it is impossible to remove all the bulbs from the soil when digging. Bulb growers are agreed that no matter how carefully you dig, 5 per cent of the bulbs are always left in the soil; thus leaving enough larvae there to infest the planting the following spring unless the planting is moved to some other locality.

This is the method that is being employed by some of the growers now. All the bulbs are dug each year, and all the stock is given the Hot Water Treatment, and then the treated bulbs are planted in a locality away from the older commercial plantings. All bulbs that are found to be infested at the time of digging are destroyed either by burning or by boiling in water.

Experiments conducted with ovicides on a commercial planting in the spring of 1926, gave promising results. The advantage of this treatment is that the insect is killed before the damage is done, while the Hot Water Treatment kills the insect after the damage is done and even then the grower is not assured that his crop will be free of infestation the following spring. The results of this experiment are given below:

TABLE 1.—FIELD TREATMENT FOR THE CONTROL OF THE NARCISSUS BULB FLY—1926*

Treatment	No. bulbs in plot	No. bulbs infested	% of bulbs infested
Dormoil 2%	741	15	2.02
Corrosive sublimate 1 oz.–10 gal. water	816	0	0.00
White oil emulsion 4%	681	46	6.75
Check—No treatment	736	52	7.06

*Bulbs examined in August 1926.

Five applications were made, the solution being poured about the base of the plants. The first application was made April 23 and the last May 27. A more detailed account of this field test and the results of the same on the control of the Lesser Bulb Fly will be found in October, 1926, number of the JOURNAL.[2]

It is planned to continue the experiments with ovicides for several seasons so as to determine the effects of the treatment on the growth of the bulbs and on the control of the flies.

EXTENSIONS OF THE KNOWN RANGE OF EUTETTIX TENELLUS BAKER AND CURLY-TOP OF SUGAR BEETS

By WALTER CARTER, *Bureau of Entomology, U. S. Department of Agriculture, in cooperation with Idaho and Montana Experiment Stations.*

ABSTRACT

A severe outbreak of the sugar beet leafhopper (*Eutettix tenellus* Baker) during 1926, which caused heavy losses to the sugar beet industry in the intermountain region, was accompanied by a wide dispersal of the insect. This paper records observations made on the occurrence of the leafhopper and curly-top disease during

[2]Wilcox, J. (1926) "The Lesser Bulb Fly, *Eumerus strigatus* Fallen, in Oregon. Jl. Ec. Ent., Vol. 19, pp. 762–772.

a survey undertaken in cooperation with the States of Idaho and Montana and Canada to determine the new range of the pest.

The year 1926 proved a disastrous one for the sugar-beet industry in the intermountain region, owing to the severe attack of the sugar-beet leafhopper (*Eutettix tenellus* Baker). All indications are that the season has been one of general dispersion of the insect, and for that reason the arrangements made by the Bureau of Entomology for cooperative surveys covering the distribution of this species and its principal food plants in Montana, South Dakota, and Alberta, Canada, proved especially opportune. The results from South Dakota will be published separately. Some data from Wyoming collected by Mr. R. W. Haegele, of the Idaho Experiment Station, are included, as well as some from British Columbia near the Idaho boundary. The data are tabulated below.

PLACE	DATE	OBSERVER
Montana—Florence, Stevensville, Paradise, Charlos Heights Lolo, Plains, Ravalli, Charlo, Arlee, Dixon, Perma, St. Ignatius, Missoula.	August 17, 1926	J. R. Parker[1] and W. B. Maybee

All the above-mentioned places are in the Bitterroot Valley or in the vicinity of Flathead Lake, Montana. The records are for the insect only.

Canada, British Columbia—Rykerts, Kingsgate, Creston	August 10, 1926	R. W. Haegele[2]
Wyoming—Green River, Rock Springs, Eden, Jackson Hole	September 29, 1926	
Montana—Heron, Thompson Falls,	August 13, 1926	

Records for Wyoming are for *E. tenellus* only. Garden beets with typical curly-top symptoms were reported by this observer from Creston, B. C., and Heron, Montana. The specimens from Creston were tested by the writer by feeding individuals of non-infective *E. tenellus* on them and then transferring these to healthy beets. All these beets developed symptoms of curly-top in about 10 days.

Wyoming—Mammoth Hot Springs, Yellowstone National Park.	August 10, 1926	Walter Carter
Montana—Gardiner, Daly, half way between Gardiner and Livingston.		

[1]Montana Experiment Station.
[2]Idaho Experiment Station.

Above records are for *E. tenellus* only.

Montana—Billings and vicinity, August 30, 1926 Walter Carter

Two cases of curly-top suspected in beets in Great Western Sugar Co. territory. Specimens brought in to Twin Falls laboratory and tested gave positive results.

Montana—Bitterroot Valley, August 30, 1926 Walter Carter

Both *E. tenellus* and curly-top found on mangels.

Negative results were obtained in a survey made for *E. tenellus* by H. L. Seamans[3] on September 22, 1926 in the Province of Alberta, Canada, over an area bounded on the west by Cardston, Pincher Creek and Nanton, thence to Gleichen, and from Gleichen due east to the Saskatchewan boundary.

Discussion

The area covered by the Canadian survey comprises the most favorable territory in Alberta for breeding grounds of *E. tenellus*, considered from the standpoint of host-plant occurrence. The negative result of this survey, while not conclusive, is suggestive from the standpoint of possible limiting factors. The Bitterroot Valley records are interesting, as this valley offers an excellent opportunity for the study of limiting factors on the insect's range, since it is near the breeding grounds of the insect in Idaho.

The cases of curly-top recorded from the Billings district are the first on record for that territory. The root necrosis presented a peculiar appearance never observed in diseased beets in the Twin Falls area. On cutting through the diseased root, a black exudate oozed from the fibro-vascular bundles, which in a few minutes gave to the root the appearance of having been heavily inked.

The appearance of the insect on the east side of the Continental Divide in Montana is of much interest. Only occasional specimens could be found. Apparently 1926 was a year of general dispersal, and a reasonable interpretation is that these specimens represent the few straggling individuals which had survived a long-distance migration. The other interpretation is that they are native to that place, but, being at the edge of the natural breeding range, are few in number. No nymphs were to be found even after very close examination, and the writer is inclined to the first interpretation.

The appearance of the insect in areas separated from its natural breeding ground by high mountain ranges can not readily be explained by a teleological theory of migration. The insect is extremely small

[3]Dominion Entomological Branch (Canada).

and of light weight, and the slightest ground breeze will carry it for yards. It does, however, "migrate," and should it encounter strong winds it is quite conceivable that it might be blown into the upper air currents and by them be transported (in what must practically amount to cold storage, since these upper air currents are often of very low temperature) for very long distances.

The discovery of the insect east of the Continental Divide and of the two isolated cases of disease at Billings theoretically opens up that area as possible curly-top territory. Unless the insect is in process of rapid adaptation, however, this possibility is very remote, since there is no record of the insect successfully competing with weather such as is encountered in that area.

A MONTHLY SURVEY REPORT FORM

By J. A. HYSLOP, *Bureau of Entomology*

ABSTRACT

To better systematize and render comparable the notes on insect conditions throughout the United States received by the Insect Pest Survey in order that this information may be of use to future workers desiring statistical data, a report form listing the more important pests of each of the major agricultural regions of the United States with check columns for the various degrees of prevalence is presented. In conjunction with this form is a consideration of the several methods of unifying the conception of the various degrees of prevalence.

When the Insect Pest Survey was organized six years ago, there was no machinery for the collection of statistical data on entomology in this country, other than the localized surveys of a few States and sporadic surveys carried on here and there to ascertain the distribution of some particular insect.

The goblins of insurmountable difficulties were conjured up when this work was inaugurated and some of these in truth seemed to be very material beings. First, there was a very hazy recognition of the value of collecting data on insect abundance regardless of their quality; second, there was a general feeling that there would be an indisposition on the part of the field workers to take the trouble to send in observations; and third, there was the undoubted fact that no methods had been devised by which an observer could standardize his observations.

The first of these "insurmountable difficulties" has vanished into thin air. The symposium held in Cincinnati when the Survey was one year old brought out many interesting features regarding the methods of estimating insect abundance then in practice, but its outstanding feature was the general recognition by the entomologists that survey

work was worth while, and that methods of estimating insect abundance, which would render data comparable, were not unattainable. You all realize how the interest in this phase of entomology has grown in the past few years.

The second difficulty was more of a phantom than the first. From the very beginning the collaborators of the Survey *most willingly* "took the trouble" to send in notes; many, in fact, organized for this purpose and all have put forth a very decided effort to give the Survey each month as good a picture as possible of the insect conditions in the territory in which they are working. Each year the quantity and quality of notes have improved, each year additional states have organized for the work, until now practically every entomological agency in this country and Canada is working with a common purpose.

The last difficulty is still believed by the "conservatives" to be insurmountable. Quite true, at the present time we have but very few methods of estimating insect abundance that even fall within the bounds of statistical reliability. However, the Hessian fly workers have methods that are reasonably exact. Larrimer (Journal of Agricultural Research XXXII p. 1044) has shown that the probable error of a determination obtained by the methods used by his workers depends on the number of individuals examined and the percentage of infestation, and gives highly comparable figures.

It has been suggested that it is a waste of time to make general observations, even though these be made to the best of our present ability, until we know exactly the type of observation which will meet ideal statistical requirements. To my mind it would be folly to wait for exact knowledge of this character before doing anything, and such reasoning seems to me the veriest nonsense. Had Thomas Say waited to describe his first insect until the necessary information was at hand that would make his description complete for every detail that would be needed at any time in the future, he would have died without ever having described a species. The same would have been true of all subsequent taxonomists not only of the past, but of the present. Who would say that the old observations of the weather made with crude apparatus and very little knowledge of the succession of storms were not worth while? Of course it would be ideal, and would render our notes decidedly more valuable, if we could include every detail that might in the future throw light on the reason for the current condition. We believe, however, that we should not wait a single hour but that every observation that is made by a competent entomologist should be recorded and placed in a common repository where it can be examined

by future workers. And this we are doing. Who can tell us what the general situation was throughout the United States relative to any of our common pests in 1916? A few persons may remember some pest in which they were particularly interested over a necessarily limited region, otherwise that page of the entomological record is blank. However, from 1921 to the present time, the period over which the survey has functioned, we have a fairly definite picture of general insect conditions throughout the country for any year, or any month.

This much has been accomplished and we feel that we are now ready to take the next step forward in *Survey Work*, and that this and every successive step will be in the direction of more detailed and refined observation.

I shall present this evening an outline of a type of report which I believe will be a step in this direction and yet will not be so great a stride as to embarrass the field worker or add unduly to his work.

One of the outstanding weaknesses of our reports in the past has been the lack of negative data. Serious outbreaks are almost invariably reported, even unusual abundance is generally observed, but the absence of a pest or its decided reduction in numbers is usually overlooked. An exception to this is found in the many reports received this year on the marked decrease in numbers of aphids on deciduous fruits. We have also felt another weakness of a more involved nature, that is, the lack of uniformity in the conception of the prevailing degree of infestation in the case of most of our insect pests.

To limit the number of species upon which reports are to be made is an extremely hazardous procedure. Very often our most interesting notes on an insect are received from a region where this insect is not of general economic importance. The unusual occurrence of *Alabama argillacea* Hbn. in New England is far more interesting and may lead to conclusions on fundamental principles which never could be arrived at by observing this insect in its normal habitat. We do not wish any of our collaborators to feel that the report form which we are now proposing is in any way intended to take the place of the general and miscellaneous notes on all insects that come under their observation such as they have been sending in during the past few years. This new form should be considered as merely supplementary, and additional to the general reports. Of course it would not be necessary to duplicate notes on the insects which are covered by the report form, though such duplication would not be amiss. Rather than discontinue miscellaneous observations we would much prefer that you omit filling in the special report form.

The report form that I am presenting is arranged as a questionnaire. This necessitates limiting decidedly the number of species upon which reports are to be made. Now to limit the number of species involves, first, selection on the basis of relative importance. To name the three or four insects of first importance in any region is not so very difficult, the naming of the next six or seven, however, would be purely a matter of personal opinion and the same observer would include different species if he went from one region to another. We therefore conceived the idea of dividing the country into a limited number of natural crop regions, and selecting for each of these regions the 10 or 20 most important species.

You have all received my letter asking your opinion as to the most important insect pests of your state. The replies have been most interesting and enlightening. Fifty-one reporters representing 42 States have selected their 10 most important species, and in some States two or three collaborators sent in independent lists. You will note (Table 1) that in most of the regions there is a very decided uniformity of opinion as to the relative importance of the insects of that region, so I believe that our list very truly represents the relative importance of the insects as far as the economic entomologist is concerned. Of course it does not necessarily represent the *actual* economic importance of these pests. Undoubtedly over the Gulf region the mosquito is economically as important as the boll weevil, but it is not attracting the attention of the economic entomologist in that region to anywhere near the same degree.

Throughout the entire country the five species and groups of species attracting the most attention, arranged in the order of their importance, are the codling moth, cutworms, the corn ear worm, the San Jose scale, and grasshoppers. About 25 species of insects are of major economic importance throughout a large part of the United States, and about 50 species are of interest in three or more states. The remainder of our pests are of local distribution or at least local economic importance. Of the first 10 species selected by the entomologists as of most importance, 7 were among the 10 most frequently reported to the Insect Pest Survey during the past six years. This is very interesting, as it shows that the data we are receiving, even with our crude methods, are of decided statistical value.

Having picked the 10 or 20 species for each of the regions the second consideration with regard to this report form was to prepare a series of definitions which would remove as far as possible the personal factor in deciding upon the degree of infestation prevailing. For the present it

was felt that six degrees of differentiation would be as fine as should be attempted. Though we realize that percentages are often meaningless or nearly so, in survey work, we have, for convenience, laid out six degrees of abundance or damage as an index to abundance as follows: The first degree should be 0 and the last degree should be 100 per cent. The four intermediates should be from 1 to 20 per cent, from 21 to 40 per cent, from 41 to 60 per cent, and from 61 per cent to 80 per cent from which point the rather hazy 100 per cent should be recognized. Now, roughly, 0 per cent means that the insect is absent; 1 to 20 per cent means that the insect is present in negligible numbers; 21 to 40 per cent should cover what is usually spoken of as moderate abundance, 41 to 60 per cent should have the general significance of abundant; 61 to 80 per cent should mean very abundant; and 81 to 100 per cent should describe an epidemic. These generalized definitions are not easily translated into the terms of any given insect, each insect must be considered by itself, so we conceived the idea of defining for each of these insects each degree of infestation. That these definitions will have to be modified and changed, there can be no doubt; that they will make recorded observations more comparable throughout the entire country, is just as evident; that they will lead to a general improvement in the methods of estimating insect abundance I am confident.

That many insects can not be readily counted is evident, and the abundance of some of these can be best estimated by the effect they produce upon the host. For example, take the striped cucumber beetle. If it can not be found in the area surveyed, the insect is considered as falling in the first category. If a few beetles are observed but are doing no noticeable feeding, the infestation belongs in the second category. If feeding is noticeable and some injury to parts of the plant can be observed, but the plants in general are in good growing condition, the insect infestation is considered in the third category. If most of the plants are affected, and some of the plants are destroyed though a stand is still possible, the infestation is placed in the fourth category; if all or most of the plants show serious effects from the attack and a very poor crop is certain, the infestation is in the fifth category. If the crop is totally destroyed, we consider the infestation 100 per cent.

In addition to recording the degree of infestation we provide for recording the total area surveyed. The area may have been a single 2-acre cucumber field, it may have been one-half dozen fields in a township, it may have been five or six fields in the country, or it may have been a great many fields throughout the State. We further provide for recording the unit area actually examined; that is, whether 5 or 6 hills or

TABLE 1.—A TABLE INDICATING THE NUMBER OF STATES IN EACH GEOGRAPHICAL REGION WHICH PLACE THE GIVEN INSECT AMONG THE FIRST 10 IN IMPORTANCE IN THAT STATE.

	New England	Middle Atlantic	South Eastern	East Central	North Central	West Central	Lower Mississippi	Rocky Mountains	Great Basin	South Western	Pacific Coast	States	Reporters
Carpocapsa pomonella	4	7	2	5	1	4	2	2	2	1	3	33	40
Noctuidae	3	4		3	2	4	3	1	1		2	23	25
Heliothis obsoleta		3	3	3	1	4	6	1				21	23
Aspidiotus perniciosus	1	4	1	4		1	5		2		1	19	21
Acridiidae	2			3	2	3	2	2	2	1	1	18	21
Elateridae	3	3			2	1	1		2		2	14	15
Phyllophaga spp	2	2		2	2	3	1		1			13	16
Empoasca mali		3	2	3	3	1						12	13
Leptinotarsa 10-lineata	2	1		1	2		3	2		1		12	13
Conotrachelus nenuphar	3	5	2				2					12	12
Anthonomus grandis			4				6					10	12
Aegeria exitiosa		6	1	1			2					10	12
Phytophaga destructor		2		4		3						9	12
Blissus leucopterus				3	1	3	2					9	10
Diabrotica vittata	2	2		2	2	1						9	9
Anuraphis roseus	2	6										8	10
Calendra spp			1	2		1	4					8	9
Epilachna corrupta		2		2				2		1		7	9
Alabama argillacea		1	1				4			1		7	8
Rhagoletis pomonella	4	1		1								6	6
Phytonomus posticus								2	3		1	6	6
Psallus seriatus			1				5					6	6
Aphis pomi	2	1		2				1				6	6
Pyrausta nubilalis	1	2		2								5	9
Laspeyresia molesta		5										5	8
Pontia rapae				1	2			2				5	6
Cirphis unipuncta		1		2		2						5	5
Musca domestica		1		1		1	1				1	5	5
Sitotroga cerealella		4										4	5
Porthetria dispar	3	1										4	4
Culicidae		2		1		1						4	4
Lepidosaphes ulmi	1				1			1	1			4	4
Popillia japonica		3										3	5
Hylemyia brassicae		2			1							3	4
Illinoia pisi		1			1					1		3	3
Pissodes strobi	3											3	3
Diabrotica 12-punctata			1				2					3	3
Macrodactylus subspinosus	2			1								3	3
Termites				1		1				1		3	3
Malacosoma americana	1	1		1								3	3
Aphis gossypii						1	1	1				3	3

TABLE 1.—*Continued.*

	New England	Middle Atlantic	South Eastern	East Central	North Central	West Central	Lower Mississippi	Rocky Mountains	Great Basin	South Western	Pacific Coast	States	Reporters
Papaipema nitela	2					1						3	3
Hylemyia antiqua					2			1				3	3
Archips argyrospila		1						1			1	3	3
Porosagrotis orthogonia					2			1				3	3
Phlegethontius spp			1	1								2	2
Erythroneura comes		2										2	2
Diabrotica longicornis						2						2	2
Brachyrhinus ovatus											2	2	2
Eriosoma lanigerum											2	2	2
Anarsia lineatella											2	2	2
Toxoptera graminum					1		1					2	2
Epitrix cucumeris	2											2	2
Rhagoletis cingulata		1									1	2	2
Crambus spp		1		1								2	2
Diatraea saccharalis			1				1					2	2
Polychrosis viteana		1		1								2	2
Loxostege sticticalis								2				2	2
Aphis maidi radicis				1		1						2	2
Eutettix tenella									2			2	2
Psylla pyricola		1										1	3
Iridomyrmex humilis							1					1	2
Chrysomphalus aonidum			1									1	2
Eriophyes oleivorus			1									1	2
Ephestia kuehniella				1								1	1
Hylemyia cilicrura									1			1	1
Chrysomphalus aurantii											1	1	1
Saissetia oleae											1	1	1
Sanninoidea opalescens											1	1	1
Epitrix subcrinita											1	1	1
Lecanium corylii											1	1	1
Forficula auricularia											1	1	1
Eleodes spp									1			1	1
Pseudococcus gahanii											1	1	1
Coccus pseudomagnoliarum											1	1	1
Plathypena scabra			1									1	1
Harmologa fumiferana					1							1	1
Gryllus assimilis					1							1	1
Meromyza americana					1							1	1

plants were examined or 100 plants or hills, whether a square yard or 10 square yards of the field were examined, whether 50 or 60 feet of row were examined, and, should the species be an orchard pest, the number of trees and the method of selection.

Of course the degree of infestation varies decidedly in importance with the date and development of the plant. For example, with the alfalfa weevil 100 per cent infestation on the day alfalfa is to be cut is of but little importance to that cutting whereas a degree of infestation ranging approximately in our second category, three or four weeks before harvest, might very easily develop into 100 per cent infestation and the total destruction of the crop before the date of harvest. We therefore provide for recording the actual date of observation. If the survey is a broad one, of course it might be necessary to give the dates beginning and ending the survey. Lastly, we provide for recording the stage of plant growth; that is, whether the plant is in bloom, just sprouting, fully ripened, or otherwise.

To make it unnecessary for the reporter to remember the definitions for the several degrees of infestation for each insect, we propose printing the descriptions in pale blue ink in the place where the record is to be made and over which notations in lead pencil, black ink, or typewriting can be easily made. Thus the recorder will not have the trouble of referring to a key sheet.

Many species lend themselves very nicely to actual counting methods. For example, the Hessian fly can be actually counted in the larval and flaxseed stages, and the percentages of infested culms and the number of flies per culm recorded. In such cases, under the degree of infestation it will be desirable to write in the actual percentage observed; that is, if the percentage fell within the 21 to 40 per cent degree of infestation it will be desirable to note 38 per cent under that heading, if 38 per cent happened to be the percentage actually counted.

We realize that this type of report form is still very generalized and that, for certain insects, many of our collaborators are making much more detailed observations. We have therefore outlined a special form which, though intended to be sent in once a month, provides for weekly recording. Here a single card is provided for each of a very limited number of species. On this card space is provided for practically the same data as on the General Monthly Report Form previously described, but a separate series is set aside for all reports falling withn the first week of the month, another for the second week, another for the third, and one for the last week of the month.

To those who are carrying on intensive investigations of one or two important pests we would very strongly suggest that if you wish to do a great service for Economic Entomology you attempt to ascertain what an adequate sample of the insect in question is, and the range of infestation, in order that we may at some future time specify what the unit area should be for each insect and the distribution of these unit areas necessary for a given total area. Investigations along this line applying statistical methods to entomological observations can not but help very materially to advance the work of the Insect Pest Survey.

DISPERSION OF *COMPSILURA CONCINNATA* MEIG. BEYOND THE LIMITS OF THE GIPSY MOTH AND THE BROWN-TAIL MOTH INFESTATION

By J. V. SCHAFFNER, JR., *U. S. Bureau of Entomology, Melrose Highlands, Mass.*

ABSTRACT

The following is a brief account of the attempt made to obtain data, and some of the results achieved, on the dispersion of the imported Tachinid, *Compsilura concinnata* Meig., beyond the limits of infestation of the gipsy moth and the brown-tail moth.

While *Compsilura concinnata* Meig. was confined to the areas in New England infested by the gipsy moth and the brown-tail moth, larval and pupal collections of these species were made in various localities each year to determine the relative increase and the dispersion of this parasite. Records also were obtained from collections of native larvae that were sent in from time to time by men employed in the field and by others interested in insect collecting. Only a few collections of native larvae were received from territory outside of the infested area.

By 1922 *C. concinnata* had spread beyond the known limits of the infestation of these two moths, so if further information on the dispersion was desired other means had to be adopted.

In the study being made of the native species that are being attacked by the introduced parasites, we have recorded over one hundred that are suitable hosts of *C. concinnata*. It has been learned also, that during August was the best time for collecting the greatest variety of suitable host larvae.

It was decided, therefore, that a trip by automobile should be made through a section of country outside of the known infested area, especially to collect larvae that are known to be suitable hosts. The first trip, made in August, 1922, and covering a period of three and one-half days of collecting, was successful; as a result, similar trips embracing larger areas have been made each year since.

An idea of the territory to be covered was made up beforehand, but it was understood that availability of good roads was to determine the exact route. Two men traveled together in a touring car, taking along a good supply of mailing tubes for the collections. One man drove, while the other watched for infestations or suitable places in which to collect. Attempts were made to obtain collections at least every ten miles, and at more frequent intervals if material could be found. Usually only one species was placed in a mailing tube, but occasionally, to save tubes, a few small collections were combined. A note was enclosed in each tube, giving the date, locality, species collected, food plant, the abundance, and the name of collector. As soon as a large town was reached all the accumulated material was mailed to the laboratory at Melrose Highlands, Mass.

The accompanying map shows the location of recoveries of *C. concinnata* outside of the area infested by the gipsy moth, and the routes taken on collecting trips. It will be noted that the collecting was done for the most part in a westerly direction from the area infested by the moth. In Maine, beyond the points of colonization and recoveries of this parasite, no attempt was made to obtain larval collections until 1925. Many collections from Long Island, New York, west to the Delaware Water Gap, and south through the area in New Jersey infested by the gipsy moth have been received since the moth was discovered and the extermination work begun there in 1920.

In 1921 *C. concinnata* was recovered from native larvae collected at (4)[1] Garrison, N. Y., (34) Greenport, N. Y., and (7) Castleton, Vt. These localities were outside of the area known to be infested by the gipsy moth at that time. In 1922 several collections were sent by field men to the Melrose Highlands laboratory from the northern section, and the collections from the vicinity of New York City and southward were taken care of at the Somerville, N. J., station.

At first there was some doubt about obtaining enough suitable host material to make a trip worth while; the first trip was therefore made through a section from which no larval collections were being received, and where it was felt that the possibilities of recovering *C. concinnata* were greatest. Four recoveries were made from material collected on this (1922) trip.

During the summer of 1923 recoveries were made from native larvae sent in from (9)Shawangunk, N. Y., (8) Salem, N. Y., (3) Armonk, N. Y., (33) Brooklyn, N. Y., and (22) Swanton, Vt., by men connected

[1]The numbers correspond to those on the map and indicate the location of towns mentioned.

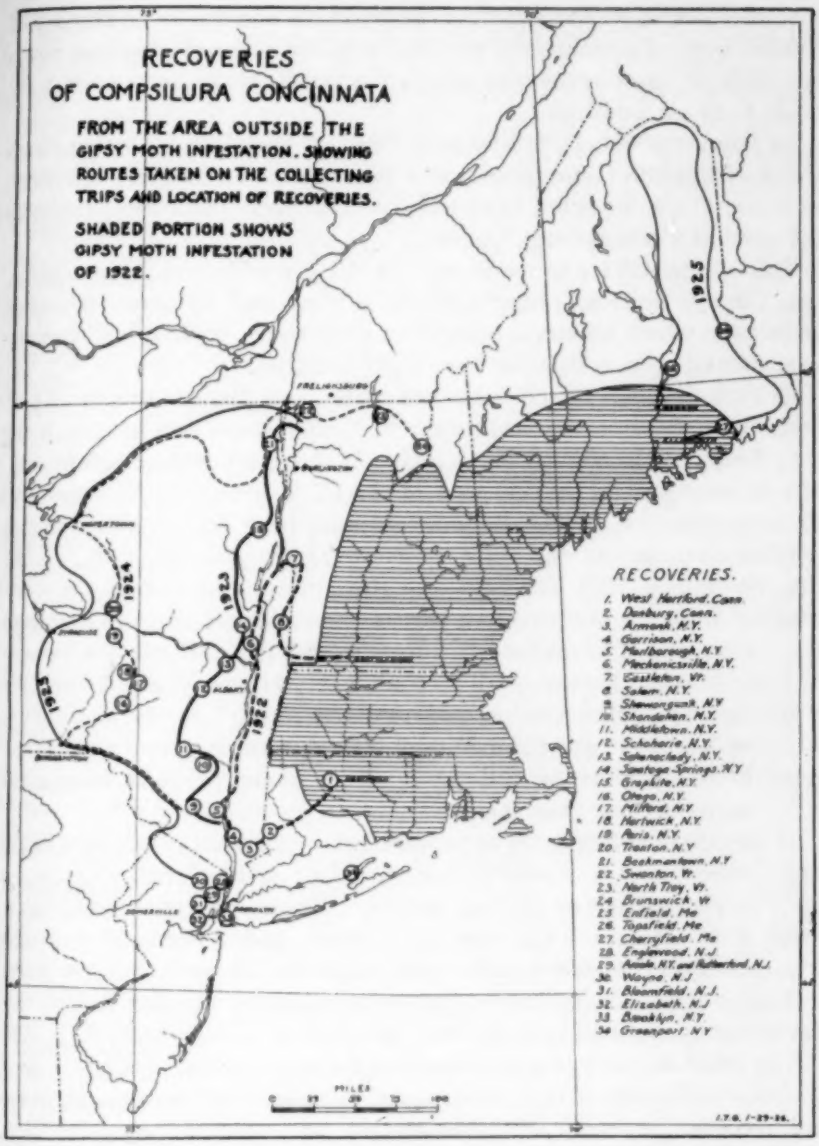


FIG. 25.—Map showing recoveries of *Compsilura concinnata* Meig. from the area outside the Gipsy Moth infestation (Prepared by I. T. Guild)

with the New York Conservation Commission and the U. S. Bureau of Entomology. Consequently, the 1923 trip was planned west and north of points of these recoveries, and, as a result, seven recoveries were made from six localities.

In January, 1924, L. S. McLaine, Chief of Division of Foreign Pests for the Canadian Government, in a letter to A. F. Burgess, in charge of Moth Work, reported the recovery of *C. concinnata* from material collected at Freleighsburg, Quebec.

The trip in 1924 was made west of the Catskills and Adirondacks, also through sections of northern New York and Vermont, covering areas from which no larval collections were being received. *C. concinnata* showed up in collections from eight localities.

In 1925, through the co-operation of the New Jersey Department of Statistics and Inspection, collections of native larvae were sent in from New Jersey by the nursery inspectors. As the result of these collections, and of some sent in by field men of the U. S. Bureau of Entomology, six recoveries of *C. concinnata* were obtained from five localities in the northeastern part of the state, namely (28) Englewood, (29) Arcola, (31) Bloomfield, (32) Elizabeth and Rutherford. No collections were received from the northwestern part of the state; the trip for 1925 was therefore planned to include this section and the northeastern corner of Pennsylvania, thence north to the Liberty Highway, along the Liberty Highway to Binghamton, and northerly through central and northern New York. It was planned to obtain, if possible, larval collections from 25 to 50 miles beyond the localities where previous recoveries of *C. concinnata* had been made.

It was deemed advisable to procure native material this year (1925) from eastern and northern Maine, and four and one-half days were spent collecting larvae in that section. Three recoveries have been made from Maine and one from New Jersey, as the result of the 1925 trips. A considerable amount of insect material was picked up on these collecting trips. Miscellaneous larvae were taken, whether or not the particular species had been recorded as a host of *C. concinnata*.

The table on the following page lists the host material collected, and the recoveries from it of *C. concinnata*. Unidentified larvae, and those not recorded as hosts of *C. concinnata*, are omitted from this list.

HOST MATERIAL AND RECOVERIES OF *Compsilura concinnata*

	No. of Collections				Number of Larvae				No. Recoveries of Compsilura			
	1922	1923	1924	1925	1922	1923	1924	1925	1922	1923	1924	1925
Aglais milberti Godart	0	0	0	2	0	0	0	340				
Anisota rubicunda Fabr	0	0	1	1	0	0	73	11				
Anosia plexippus L	8	3	13	0	23	4	66	0				
Anisota senatoria S. & A	0	0	3	3	0	0	490	384				
Apatela americana Harr	0	0	0	3	0	0	0	10				
Apatela furcifera Guen	1	0	0	0	1	0	0	0				
Autographa brassicae Riley	1	0	0	0	8	0	0	0				
Automeris io Fabr	8	8	1	2	16	28	1	2	1			
Basilarchia sp	0	0	0	1	0	0	0	1				
Callosamia promethea Dru	1	1	1	1	9	3	1	6				
Cimbex americana Leach	0	0	2	6	0	0	9	32				
Cingilia catenaria Dru	0	1	0	0	0	3	0	0				
Datana angusii G. & R	0	0	0	1	0	0	0	82				
Datana integerrima G. & R.	0	0	0	1	0	0	0	109				1
Datana ministra Dru	0	8	21	27	0	374	1648	1217		5	5	
Datana perspicua G. & R		0	0	0	53	0	0	0				
Diacrisia virginica Fabr	3	1	1	2	3	2	1	2				
Epargyreus tityrus Fabr	17	14	3	6	194	225	5	100	1			
Estigmene acraea Dru	2	1	4	4	4	3	4	4				
Euchaetias egle Dru	9	9	9	10	242	319	425	501	2	1		
Euvanessa antiopa L	0	1	3	9	0	89	282	955			1	
Evergestis straminalis Hubn	0	0	0	1	0	0	0	67				
Halisidota caryae Harr	1	5	11	9	1	105	913	15			2	

	1922	1923	1924	1925	1922	1923	1924	1925	1922	1923	1924	1925
Halisidota maculata Harr....	0	1	6	20	0	3	48	498				
Halisidota tessellaris S. & A..	13	13	3	2	37	26	22	5				
Hemerocampa leucostigma S. & A.....	3	1	0	4	3	11	0	126				
Heterocampa species.....	0	0	1	3	0	0	1	148				
Hydria undulata L.....	1	0	0	2	90	0	0	162				
Hyphantria cunea Dru.....	0	2	4	0	0	436	390	0				
Lycia cognataria Guen.....	0	2	1	6	0	2	1	7				
Mamestra ligitima Grote....	0	0	1	0	0	0	1	0				
Mamestra picta Grote.....	0	0	0	3	0	0	0	13				
Melalopha inclusa Hubn.....	0	0	0	2	0	0	0	250				
Nadata gibbosa S. & A.....	0	0	0	1	0	0	0	1				
Neurotoma fasciata Norton...	0	0	0	1	0	0	0	208				
Notolophus antiqua L.....	0	1	0	4	0	1	0	54				
Paonias excaecatus S. & A..	0	0	0	4	0	0	0	6				1
Papilio polyxenes Fabr.....	1	0	0	0	1	0	0	0				
Papilio troilus Linn.....	1	0	0	0	10	0	0	0				
Papilio turnus Linn.....	0	1	1	1	0	1	1	1				
Pheosia rimosa Packard.....	0	1	0	0	0	1	0	0				
Pholus pandorus Hubn.....	1	0	0	0	1	0	0	0				
Polygonia comma Harr.....	0	1	0	0	0	6	0	0				
Polygonia interrogationis Fabr	0	0	0	7	0	0	0	130				
Pontia rapae Linn.....	1	0	0	1	60	0	0	75				
Samia cecropia Linn.....	0	1	1	0	0	1	1	0				
Schizura concinna S. & A.....	0	13	22	58	0	596	2091	2788		1		2

Schizura unicornis S. & A. . .	0	1	0	1	0	1	0	1				
Scoliopteryx libatrix Linn. . . .	0	0	0	1	0	0	0	1				
Sphinx chersis Hubn.	0	0	0	2	0	0	0	3				
Sphinx gordius Stoll.	0	0	2	0	0	0	2	0				
Symmerista albifrons S. & A. .	0	0	0	4	0	0	0	159				
Telea polyphemus Cram.	1	0	1	0	1	0	1	0				
Thanaos sp.	0	1	0	0	0	2	0	0				
Vanessa atalanta Linn.	3	0	0	0	7	0	0	0				
Totals	78	91	116	216	764	2242	6477	8474	4	7	8	4

In the table below are listed the locations of recoveries of *Compsilura concinnata* from native larvae collected outside of the area infested by the gipsy moth and the year each of these recoveries was made:

RECOVERIES MADE AS THE RESULT OF COLLECTING TRIPS

1922	1923	1924	1925
(1) W. Hartford, Conn.	(10) Shandaken, N. Y.	(16) Otego, N. Y.	(25) Enfield, Me.
(2) Danbury, Conn.	(11) Middletown, N. Y.	(17) Milford, N. Y.	(26) Topsfield, Me.
(5) Marlborough, N. Y.	(12) Schoharie, N. Y.	(18) Hartwick, N. Y.	(27) Cherryfield, Me.
(6) Mechanicsville, N. Y.	(13) Schenectady, N. Y.	(19) Paris, N. Y.	(30) Wayne, N. J.
	(14) Saratoga Sprgs., N. Y.	(20) Trenton, N. Y.	
	(15) Graphite, N. Y.	(21) Beekmantown, N. Y.	
		(23) North Troy, Vt.	
		(24) Brunswick, Vt.	

RECOVERIES FROM MATERIAL SENT IN BY STATE EMPLOYEES AND BY FIELD MEN OF THE BUREAU OF ENTOMOLOGY

1921	1922	1923	1924	1925
(4) Garrison, N. Y.	(No recoveries)	(3) Armonk, N. Y.	(No recoveries)	(28) Englewood, N. J.
(34) Greenport, N. Y		(8) Salem, N. Y.		(29) Arcola, N. J.
(7) Castleton, Vt.		(9) Shawangunk, N. Y.		(31) Bloomfield, N. J.
		(33) Brooklyn, N. Y.		(32) Elizabeth, N.J.
		(22) Swanton, Vt.		(29) Rutherford, N. J.

Since the discovery of the gipsy moth in New Jersey in 1920 many hundreds of native larvae from that state have been reared. Until

1925 no recoveries of *Compsilura concinnata* were made except in the immediate vicinity of points of liberation in the moth-infested zone. The recoveries in 1925 from the northeastern part of the state indicate that this parasite is very common there. For example, one collection of 27 larvae of *Euvanessa antiopa* Linn., from Elizabeth, produced 57 individuals of *C. concinnata*.

Apparently this parasite is spreading westward more rapidly than it is southward. From the results achieved, it appears to have worked its way westward through the country south of the Adirondacks, and around or over the Catskills. In the past two years an abundance of material was collected west of the Adirondacks, but without results so far as this parasite is concerned. However, the fact that this species was not recovered from collections made in various localities does not necessarily mean that it is not present there.

The recoveries in the localities farthest west prove that this parasite has at least spread to points approximately one hundred miles west of the known limits of the gypsy moth infestation, and that it thrives on native hosts without the presence of the gipsy moth and the brown-tail moth, for the control of which it was introduced.

It is also of interest to note that the principal hosts of *C. concinnata* outside of the area infested by the gipsy moth and the brown-tail moth are often pests of considerable importance, and there is no doubt that this parasite acts as a check on many of them.

HOW SHALL WE IMPROVE THE MEETINGS OF OUR ASSOCIATION?

EDITORIAL NOTE: For several years criticisms have been made regarding the arrangement of programs, time allowed for presentation of papers, sectional divisions with overlapping sessions and other matters. With the marked increase in membership and the usual activities of the members, a larger number of papers are scheduled for each succeeding meeting, and the situation becomes more and more acute. The usual remedies suggested are: more sectional meetings, decreasing the time of each paper, and presenting abstracts in place of papers.

The following paper by Professor Roger C. Smith is so filled with constructive suggestions that we print it here, hoping to bring out other plans, and comments and criticisms from the members. In order to have the benefit of all such plans and discussion, in preparation for the forthcoming meeting at Nashville, Tennessee, please send your opinions at once to the Associate Editor, W. E. Britton, Chairman Program Committee, Agricultural Experiment Station, New Haven, Conn.

A PLAN TO FACILITATE THE ANNUAL MEETINGS OF THE VARIOUS SECTIONS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE WITH SPECIAL REFERENCE TO THE ENTOMOLOGICAL SECTIONS[1]

By ROGER C. SMITH, *Professor of Entomology, Kansas State Agricultural College.*

The overcrowded condition of the programs in many of the sections of the American Association for the Advancement of Science is a subject of wide comment. As a result of this condition, the discussion of papers is either prohibited or severely limited, either by necessity or by common consent. The writer has been impressed too by the small amount of authentic information about papers presented, brought back from the meetings by many folks, unless notes were taken at the meeting. Very few hearers take notes, however. It is a matter of agreement that the most important reasons for attending these meetings are the meeting of folks you have heard about, whose papers one has read, or of old friends. Since most of the papers will be published and may then be read, the papers are of second interest but of real importance. To offset the crowded programs, the various societies are dividing into smaller groups, so there may be several to a half dozen groups in one's particular field in session at the same time. It is, therefore, utterly impossible to hear many papers given, or to meet as many people as one might wish by attending the meetings. These facts, together with an acknowledgment of the value of exhibits and that membership in the various sections is gradually increasing, are the reasons for suggesting a new plan.

THE PLAN. It is suggested that papers be presented on the exhibit plan and that the regular sessions become largely discussion meetings. A person having a paper to present would notify the Secretary, as at present, and would be assigned a place at a table, possibly an improvised one, in some room. He would then be entitled to have the first carbon copy of his paper placed there, with the abstract or summary on top, saving the original copy to send to the editor. Tables of data and plates of drawings would be hung on the wall above or arranged in some conspicuous position in the space allotted. He may show specimens or microscopical preparations with the aid of suitable apparatus. Chairs or stools might be made available. The lighting would have to be adequate. The spaces would be assigned in the same sequence as the papers appear on the program, thus allowing the present commendable plan of grouping papers of related subject matter.

Members and visitors could then pass along this row of exhibits at their convenience, reading summaries, examining the papers as much

[1]Contribution No. 361 from the Entomological Laboratory, Kansas State Agricultural College.

as they desired. Illustrative material might be examined first hand. It would be desirable to have designated by the author on a card at each space a period or the periods, preferably before the session in which the paper is called, in which he may be at his space to discuss the work with others. These exhibits would be in charge of an elected assistant secretary who would see that they were properly placed, before the first session of the meetings, to keep them in order and to return the exhibits to the authors. He would be given authority to appoint an ample committee to assist him, which in most cases could be most profitably made up of members who live near where the meeting is to be held.

Regular sessions would be held for discussion as is now done, except that the papers would not be read. The author would read his abstract or make comments on the work, being strictly limited to three to five minutes when his paper is called. If there is no discussion, no questions or contributions to the subject at hand, the next paper is called. To save further time, persons to be called upon at each session might take seats at the front of the room.

It is believed with this plan that the sessions may be reduced in number and in length, for perhaps many papers of restricted interest would pass without comment. The remainder of the time would then be available for visiting, discussing matters in groups, or, what is still more important, examining the offerings of members of other sections. The exhibit rooms would be kept open all day and during at least a part of the evening, so that persons might be accommodated over a long period of time. Papers and exhibits of authors not attending the meeting and papers now read by title would be assigned to spaces, but they would not be called in the session. Provision could also be made for papers completed too late to be listed on the program, but such papers need not be called in the regular meeting, except by action of the society. The program of the association should be distributed before the meetings so that visitors could plan their time to best advantage according to their special interests.

ADVANTAGES. The big advantage and aim of the plan is to save time and increase the efficiency of the meetings. This would most certainly result. Those attending the meetings could get all the information they wished about papers on work in their particular field regardless of what particular days they attended the meetings. They could give the papers more attention than when they are given orally. Members and visitors should, therefore, bring away from the meetings far more information about the work, and it would be accurate. Microscope slides and actual material exhibited will greatly clarify the subject under discussion.

Many times an examination of this material alone would be all that would be necessary. Persons would pass along the row of exhibits, stopping to read summaries and examining material as they wished. Contributions of members not in attendance would be available for examination and likewise papers now read by title. It would not be necessary to be present at all of the different sessions of the various societies to find out what is going on in various fields of research. The various contributions with illustrative material would be available for examination during the whole meeting, including evenings. Older members whose time is now largely taken up by committee work could examine the contributions and bring home a more adequate idea of the work of the year as represented by them. In fact, it would allow an increase of committees and caucuses for the discussion of specific problems, a laudable and very desirable arrangement. It would encourage the preparation of high grade illustrative material, such as good slides, good mounts, drawings, photographs and charts. One would get many practical suggestions on the preparation of such materials.

Because of the saving in time effected, the number of days a section needed to be in session could be reduced. Individuals might effect a saving in personal expenses for attending the meetings. It would allow the increase of sessions for symposia and invitation addresses in fields of general interest without unduly influencing the length of sessions. This method is capable of accommodating a greatly increased membership, thus doing away with the splitting off of sections or divisions. It is fair to all. No one need be slighted nor cut down because of brevity of time, even if his paper comes at the first or last sessions when attendance is smallest. His work would be available to all during the entire session.

DISADVANTAGES. No plan is without some disadvantages. The following are all the disadvantages which occur to the writer or have been suggested to him by his associates.

1. This plan would involve some expense. Papers and illustrative material would have to be sent to the assistant secretary or some member of his committee before the meeting and returned to the authors after the meetings. Postage and express charges would be incurred and the return cost borne by the societies. Improvised tables might have to be prepared, involving some expense for lumber and carpenter work. Perhaps some lighting changes would be necessary. Some microscopes and binoculars would be needed. Perhaps the number available locally would be insufficient. Since the assistant secretary would have to spend

several days before the meetings arranging the exhibits and about the same length of time putting things in order after the meeting, a portion, at least of his expenses should be paid. The increased cost is the most serious criticism of the plan. It usually costs money to save time. Perhaps an exhibitor's fee of fifty cents or a dollar could be charged as is now commonly done at fairs and many other kinds of exhibits. The expense could be held down to an inconsiderable sum, however. Many authors would take their exhibits home with them. The lumber used would be little or not at all damaged and would be taken back by the lumber company with perhaps only a delivery cost.

2. Could rooms of sufficient size be obtained in which to arrange these papers and illustrative material? It would be desirable to have all the papers of a section in one room. There might be some difficulty here also. Usually the meetings are held in either high school or college buildings. Laboratories of sufficient size would generally be available. The ideal situation the writer believes would be to arrange the papers and exhibits of all the sections of the entire association at one place. Usually the city auditorium or Memorial Hall could be made available and would provide sufficient space. One could then examine the contributions of other sections without loss of time. Some special lighting arrangements would be necessary for the use of any microscopes and binoculars used under such conditions.

3. There might be some loss of material, filching of slides or damage to microscopes. Possibly, yes, but probably the loss would be very slight. Various societies have had exhibits in a small way for years and such losses have not occurred, to the writer's knowledge. There might be some damage to microscopes unless they were fastened to the tables. Special arrangements to show slides by high power or oil immersion would be necessary to prevent injury to slides and objectives.

4. One would miss the personality of the writers in reading the papers for ones self. But opportunities are provided by this plan to meet the writers of papers face to face and to see them taking part in the discussion on the floor.

5. Papers would lose much of their force, for a well-delivered paper compels your attention. But many papers are poorly given, and in some cases the papers are really better than one thinks after hearing them delivered. Forcefullness in delivery should not be necessary to get interest in scientific work. Scientists are accustomed to judging work by the data presented. High pressure salesmanship should not be necessary.

6. Folks would not examine papers you say. We listen to some papers in sessions which we would not hear if we did not hesitate to leave the session, and are perhaps broadened thereby. This is a doubtful benefit. Since the papers are available for examination, the same information may be obtained from it or its author at one's convenience and if the program is crowded, a paper may be omitted for more important matters. The amount of good derived from the meetings under the present plan depends upon the seriousness and activity of those attending.

7. But some papers presented to the meetings are not in final form. In fact, some have not yet been written. This plan requires the finished paper. Should a paper be presented before it is in final form? Often new ideas, different interpretations, discovery of weaknesses, etc., are made during the preparation of work for publication. The writer believes that ordinarily papers should not be presented until they are finished. A brief announcement of important discoveries and very significant observations can be made, however, in abstract form, the abstract being given a place the same as a paper. This provision alone would aid in reducing the crowded programs.

8. If one must be contented with reading the papers, why go to the meetings, for practically all will be published, and they can then be read. The advantages now gained by attending the meetings would all be retained—meeting folks, hearing of work before it is published, gathering of information, personal stimulation, etc. The reader will have the advantage of seeing the specimens or microscopical preparations upon which the work of many papers is based. Published plates showing these are always less satisfactory than the actual material. One may meet the author and discuss this or other work with him and with others.

Conclusion. While this plan is not now used, at least in entirety, anywhere, to the writer's knowledge, yet its feasibility seems clear. The difficulties and valid criticisms as the writer sees it, are additional expense and certain mechanical difficulties which are however not serious. The success of the exhibits of the American Society of Zoologists at the recent meetings presages the success of this plan, which is largely an extension of that method. Authors of papers could not be expected to spend much time at their exhibits else they would miss the advantages of the meetings. This plan would solve many of the problems arising out of the present congestion and would take care of a considerable increase in membership. The meetings of many sections have reached the stage where a change in plan or policy with reference to program now seems imperative. The meetings should not be mere endurance contests, but

real opportunities for broadening one's knowledge, increasing acquaintances, and for personal inspiration. The proposed plan provides these with increased efficiency.

SCUTIGERELLA IMMACULATA NEWPORT, A PEST IN GREENHOUSES

By GLENN W. HERRICK

ABSTRACT

The Symphylid, *Scutigerella immaculata* is a serious pest to Snapdragons in greenhouses in Nyack, N. Y. The organism is widely distributed over the United States and has been reported as injurious to various vegetable crops. It is now known to occur in eastern and western New York. A solution of miscible carbon disulphide shows promise of destroying the pest in the soil of the greenhouse beds.

Early in February, 1927, "a little white insect" was reported to the author as very injurious to snapdragons in greenhouses about Nyack, N. Y. Later in the same month, I was able to get some specimens of the "insect" at work on the plants and found it to be an Arthropod resembling a centipede and clearly not of the class, Hexapoda. On further study it proved to be the rather interesting Symphylid, *Scutigerella immaculata*. One correspondent wrote that this was the first year that the pest had appeared but that it was threatening them with the loss of a considerable part of their stock. Another correspondent said that the pest had been troubling them in their greenhouses for several years. Interestingly enough they said that "we have found out that these insects are only in the solid benches. When we change the soil about the middle of June or the month of July these insects go to the bottom of the benches where it is moist. When we put the new soil in, these insects come right back in the soil we put in. But in the raised benches they cannot live, because the benches dry out and without moisture they die. But we grow our Snapdragons in the solid beds because they grow better than in the raised beds."

We were not able to visit the infested greenhouses at the time the pest was reported but later I had an opportunity of doing so. Nyack proved to be a center of snapdragon production and several greenhouses in the city grow nothing but this one flower for the New York City market. In one form of bed, called the "solid bench," the soil is placed on the ground in concrete retaining walls from 12 to 24 inches high, while in the other type of bed the soil is placed in wooden benches about eight inches deep and some three feet from the ground. The symphlyids become troublesome only in the solid ground beds. Apparently the high wooden beds are too dry for these moisture-loving animals to maintain themselves.

The greenhouse owners have the practice of changing the soil in the beds every year in late June or July. The earth is removed from the beds and transported to a near-by field where it is allowed to lie for two years undergoing a process of aeration and rejuvenation. At the end of two years, the soil is considered in fit condition to use again for one season in the beds. In an examination of the soil in one of the fields in which the earth is dumped, and from which soil for the beds is obtained each year I found the *Scutigerella* present. Evidently the animal exists out-of-doors throughout the year and is transported back and forth from the greenhouse to the field and in the opposite direction when the beds are filled.

The animals feed on the roots of the snapdragons so severely that the plants are stunted while the flowers remain small and less attractive. Three crops of flowers are expected from the solid beds but when the Scutigerellas are numerous not more than two crops can be obtained and the flowers of these are of second-rate quality.

The first record of economic injury by this animal in the United States was made by Woodworth in California in 1905, where it was injurious to asparagus in the vicinity of Sacramento. In 1912–'13 its biology and injuries were studied by E. R. deOng in California and in 1924, F. H. Wymore published an article on this species in the Pomona College Journal of Entomology and Zoology, Vol. 16, p. 73, entitled "Biology and Control of the Garden Centipede."

The organism has been reported from Mass., Ky., Ohio, Ga., Col., Utah, Calif., and Oregon. In the "Weekly News Letter concerning Insect Pests and Plant Diseases" of the Departments of Entomology and Plant Pathology of the New York State College of Agriculture for July 18, 1927, Mr. M. N. Taylor of Erie Co., reports that *Scutigerella immaculata* "has cleaned up practically all vegetation in this area of land. A trap crop of lima beans was planted to attract the Symphylids. What corn that was not destroyed was treated in the hill with cyanogas." The organism is probably widespread over the country and will become increasingly evident. In Utah it has been reported as the most serious pest to truck crops, while in Oregon it is considered very injurious. In addition to asparagus, it has been found attacking lima and common beans, vetch, peas, roots of sugar beets, fleshy roots of corn, alfalfa, wild lettuce and some other plants.

Control

One of the greenhouse owners at Nyack is trying a miscible solution of carbon disulphide in an attempt to destroy the pest in the solid beds.

She is using the material at the rate of one gallon to 100 gallons of water and with this solution she is drenching the earth which has just been brought in from the field and placed in the beds. On one bed, about 160 feet long and 3 feet wide, she used 100 gallons of the diluted mixture. After an interval of about twelve hours we (six of us) spent an hour in forking over and examining the soil in this treated bed. We found many dead individuals but much to our surprise and satisfaction not a single living one. The odor of the carbon disulphide was still strong in the soil. It is probably too much to hope that the pest was actually exterminated from this bed for we could easily have missed here and there a living individual but certainly a very large percentage of the tiny organisms was destroyed—enough, perhaps, to hold them in check until the crop is produced. In a similar bed treated with the solution at one-half of the above strength, we were able to find about one living individual to three dead ones—quite enough living ones to provide for an infestation in time to interfere with the production of a full crop of flowers.

Scientific Notes

Second Brood of Plum Curculio (*Conotrachelus nenuphar*) Reared in Illinois. In connection with the discussion on the necessity of including poison for Curculios in late peach sprays, the following record may be of interest. On May 18, 1927, wormy drop peaches were placed in cages under peach trees at Carbondale, in southern Illinois. By the first week in July adults had emerged and were caged on peach trees with uninfested peaches. When it was evident that these peaches had become wormy they were transferred to flower pot cages in the insectary. On August 20 adults of the second generation began emerging.

S. C. CHANDLER, *Ill. State Natural History Survey.*

Occurrence of Hessian Fly in Colorado. During late July the County Agent of Sedgwick County in northeastern Colorado reported that losses were being incurred in numerous wheat fields in the eastern part of the county by the falling of the wheat. An investigation by the junior writer revealed an infestation of Hessian Fly, *Phytophaga destructor* Say. The infestation was found to extend along practically the entire eastern border, and westward into the county for at least 15 miles. In several of the fields as high as 10 to 12 per cent of the wheat was down. However, three per cent of the wheat down was about an average for the infested area. This is the first infestation to be found in the State.

GEORGE M. LIST and GEORGE S. LANGFORD, *Office of the State Entomologist, Fort Collins, Colorado.*

Oak pill gall, *Cincticornia pilulae* O. S. Pin oak leaves badly deformed by this insect were received early in August from Wm. M. Bullitt, Louisville, Kentucky, and believed to be ruining the trees, which were standing in a double row on each side of a roadway and had been set about fourteen years. Some of the oaks were badly

affected, showing a scanty, pale foliage and others were practically unharmed, this latter indicating a decidedly local habit. Many of the leaves submitted for examination had from twenty to thirty moderate sized to rather large galls, not a few leaves were greatly reduced in size, and occasionally little was visible except masses of galls almost completely hiding the normal leaf tissue. Conditions in the tops of the trees appeared to be even worse. The owner stated that the appearance of the trees was ruined and he was fearful that they would be destroyed. The infestation was much more general and severe than anything previously recorded in connection with this species.

E. P. FELT

A Stationary Spraying System. An experiment which has been watched with much interest by fruit growers in New Jersey and adjoining States, has been made by Mr. Charles Repp, of the John Repp Ice & Cold Storage Co., of Glassboro, N. J., to solve the high cost of spraying.

Mr. Repp has installed in one of the orchards a stationary spraying outfit. A 13,000 gallon tank is the water supply, and this is connected to a tank of 300 gallons capacity in which the spray material is mixed. This latter tank is placed immediately above another one of the same capacity and connected with a plug. When the material in the top tank is mixed the plug is removed by a man, and the solution enters the lower tank to be pumped through the orchard. It may almost be said that the mixing is a continuous process.

The pumping station has three Friend four-cylinder pumps which maintain a pressure of five hundred pounds. These pumps are worked by means of a belt attached to a tractor, and are arranged so that in the event of a breakdown of one of the pumps it can immediately be cut out of the circuit. The pumps are connected to ½″ piping that has been laid throughout the orchard together with a return pipe of ¾″ which prevents the pressure rising too high.

The distance between each row of piping is 360 feet, and each pipe connects with a plug or faucet equipped with a special clip, so that the hose can be clipped on easily, obviating the necessity for clamps and bolts.

From each faucet 200 feet of hose is run out. At the extreme end of this stationary outfit, a distance of 3,800 feet of piping, the pressure is 500 lbs., the same as at the pumping station, and this with nine lines of hose out at one time.

Mr. Repp has put on several sprays this season by this method and is well satisfied with the results. The obvious advantages are greater speed of application (100 acres of apples are covered in 3 days, whereas with the spray wagons it took 8 days), and the condition of the soil for the early spring sprayings can be entirely disregarded.

The cost of such an outfit compares favorably with that of a good spray wagon, for sufficient piping, the actual installation of the piping, tank and pump for a 30 acre orchard would cost only $1150.00.

C. F. GREEVES-CARPENTER, F.E.S.,
Philadelphia, Pa.

SUMMARY OF VOTES IN RECENT AMERICAN REFERENDUM ON DR. POCHE'S THREE PROPOSITIONS TO CHANGE THE INTERNATIONAL RULES OF ZOOLOGICAL NOMENCLATURE

Referring to the recent referendum on Dr. Poche's (Vienna, Austria) three propositions in regard to the Rules of Zoological Nomenclature, the undersigned has the honor to report to the zoological profession the following results of the ballot—

Poche's proposition I: 8 votes for; 549 votes against.

Poche's proposition II: 4 votes for; 550 votes against.

Poche's proposition III: 4 votes for; 551 votes against.

A detailed report will be made to the Tenth International Zoological Congress (Budapest) and the undersigned unreservedly accepts the unambiguous results of this referendum as definite instructions from the profession in the United States for him to cast his vote (in the Congress as delegate, and in the Commission as member) against all three propositions.

C. W. STILES, *Professor of Zoology,*
U. S. Public Health Service

ROCKY MOUNTAIN CONFERENCE OF ENTOMOLOGISTS

The Fifth Rocky Mountain Conference of Entomologists was held in Pingree Park, August 15 to 20. A total of 56 persons registered at the College lodge, including members of the families of the entomologists in attendance. Thirteen states were represented, in addition to two representatives from Washington, D. C.

Chas. T. Vorhies, Tucson, Ariz.; Otis Wade, Lincoln, Nebr.; R. L. Webster, Pullman, Wash.; J. W. McColloch, Manhattan, Kans.; J. S. Houser, Wooster, Ohio; Wm. P. Hayes, Urbana, Ill.; W. H. Larrimer, Washington, D. C.; George G. Schweis, Reno, Nev.; Ernst Artschwager, Washington, D. C.; F. E. Whitehead, Moscow, Idaho; W. E. Shull, Ames, Iowa; George I. Reeves, Salt Lake City, Utah; F. T. Cowan, Billings, Mont.; C. H. Gilbert, Laramie, Wyo.; Miriam A. Palmer, Carl A. Bjurman, George S. Langford, C. P. Gillette, R. G. Richmond, John L. Hoerner, Sam C. McCampbell, George M. List, C. R. Jones, W. J. Morrill, (Head of Department of Forestry, C. A. C.), all of Fort Collins, Colo.; R. L. Wallis, La Junta, Colo.; M. K. Riley, Denver, Colo.; J. H. Newton, Paonia, Colo.; and A. E. Beardsley, Greeley, Colo.

The following list of subjects will give an idea of the programs given at the different sessions during the week. In addition to the subjects mentioned, there were of course a number of informal discussions that were said by many to be a very important part of the conference.

Soil Entomology—J. W. McColloch.

The Potato Flea Beetle in Washington—R. L. Webster.

Flea Beetles in Colorado—John L. Hoerner.

Symposium; History of Economic Entomology—Leaders: C. P. Gillette, W. P. Hayes, R. G. Richmond, G. S. Langford.

The Alfalfa Weevil—George I. Reeves; discussed by J. H. Newton, Geo. G. Schweis and F. E. Whitehead.

The Cherry Curculio—George M. List.

Keeping the Colorado Potato Beetle Out of Southern Idaho—F. E. Whitehead.

The Little Red Cattle Louse—W. E. Shull.

Plant Physiology and Insect Injury—Ernst Artschwager.

The Feeding Habits of Grasshoppers—George S. Langford.

Airplane Dusting—J. S. Houser (Illustrated by slides and two motion pictures loaned by the U. S. Bureau of Entomology).

Arsenites in the Control of the Mormon Cricket—F. C. Cowan.

The Work of Forestry Students in Pingree Park—W. J. Morrill.

European Corn Borer—W. H. Larrimer and J. S. Houser (Illustrated by motion pictures).

The Oriental Peach Moth—J. S. Houser.

The European Corn Borer: Large Scale Control Experiment—W. H. Larrimer.

The Caucasian Bees—R. G. Richmond.

The Honey Bee and Red Clover—R. G. Richmond.

The Potato Scab Gnat—J. S. Houser.

Mill Inspection in Kansas—W. P. Hayes.

Jackrabbit and Other Animal Life in Arizona—C. T. Vorhies.

The officers elected for the ensuing year were C. P. Gillette, Fort Collins, Chairman; J. W. McColloch, Manhattan, Kansas, Vice Chairman; George M. List, Fort Collins, Secretary; C. R. Jones, Fort Collins, Treasurer.

It was the consensus of opinion that the meeting next year should be held at about the same time and at the same place. A more complete report of the meeting is being mimeographed and will be sent to those who have attended the Conference at different times, or to any others requesting it.

GEORGE M. LIST, *Secretary*

SUMMER MEETING OF THE NORTH EASTERN ENTOMOLOGISTS

The Summer Meeting of the North Eastern Entomologists was held August 17, 18 and 19 in the form of a Field trip through the orchard districts of South Eastern Pennsylvania, Western Maryland, Eastern West Virginia and Western Virginia.

At Gettysburg on the evening of August 17, the party had an informal meeting and were welcomed into the state by R. G. Bressler, Deputy secretary of Agriculture of Pennsylvania. Mr. R. H. Bell, Director of Pennsylvania Bureau of Plant Industry also gave a brief talk, Dr. T. J. Headlee of New Jersey brought before the party the advisability of having a paper reading session of the North Eastern Entomologists. This subject was discussed by other members present and it was decided that the subject be presented again before the trip was over.

On August 18 the party visited the Entomological field station of Pennsylvania State College at Arendtsville where they were shown orchard trials of bait pails in control of the Oriental fruit moth together with laboratory equipment. Work in grub proofing forest nursery seed beds under the directions of Pennsylvania Bureau of Plant Industry were seen at Mont Alto State Forest Nursery.

In Maryland an apple orchard was visited in which a dust program was carried out. Near Hancock, Maryland, demonstrations were made of spray equipment for apple orchards and grading and washing equipment for packing of apples. In an evening session the Entomologists met with the Horticultural Society of Western Maryland at which time the assembly was addressed by Dr. R. A. Pearson, President of the University of Maryland; Dr. A. L. Quaintance, United States Department of Agriculture, gave a summary of the spray residue situation together with methods of removal; and Dr. S. W. Frost spoke on Oriental fruit moth control.

In West Virginia the cooperative packing shed and Entomological field station at Inwood were visited. The station's chief service is furnishing information for the

orchard spray service. The Mexican bean beetle in both larval and adult stages together with damage to bean leaves was exhibited.

At the Entomological field station at Winchester, Va., a demonstration was given of the behavior of Virginia and Colorado strains of codling moth. In some sprayed apples it was found that less than 1% of the Virginia moths were able to enter the fruit, while 26% of the Colorado strain made a safe entrance into the fruit. A check showed that 46% of the larvae were able to enter unsprayed fruit. Approximately 13% of the first cross entered the fruit. Orchard tests of summer applications of Vlock in 2% solution were shown. In the same orchard plots showing the use of various correctives to prevent burning from arsenate of lead and lime sulphur were shown. Gypsum and lime were checked, one against another. In the same orchard plots showing the control of apple blotch by the use of a Bordeaux mixture on North Western Greenings were seen. In another orchard various arsenicals were given tests in both light and heavy applications.

The party was welcomed into Virginia by Mr. Bell representing the Chamber of Commerce and by Mr. Glass who welcomed the party in the name of the fruit growers. At this meeting there was further discussion of the matter of a paper reading session, and the following motion was carried:

"That the Chairman appoint an executive committee of five, to include the present chairman and the chairman for 1928, for the purpose of working out the form and method of procedure looking toward affiliation of the Northeastern Entomologists with the American Association as a branch; also that the preliminary voting be conducted by mail in order that the proposal may be submitted to the American Association at the next annual meeting."

The Chairman appointed the following men to serve on this committee: Dr. T. J. Headlee, Chairman; Mr. A. F. Burgess, Prof. P. J. Parrott, Mr. V. I. Safro, 1506 Walton Avenue, New York City, and Prof. E. N. Cory, College Park, Md. (Prof. Cory to serve in place of Prof. Schoene.)

The following persons were present: A. F. Burgess, Melrose Highlands, Mass.; J. G. Sanders, Philadelphia, Pa.; R. H. Bell, Harrisburg, Pa.; P. D. Sanders, College Park, Md.; Marie Timmins, McSherreystown, Pa.; M. S. Slade, Biglerville, Pa.; H. T. Abercrombie, New York, N. Y.; J. R. Stear, Chambersburg, Pa.; F. J. Schnerderhan, Winchester, Pa.; C. R. Willey, Richmond, Va.; Herman Gerkon, Woodlawn, Baltimore, Md.; E. W. Greger, Glenside, Pa.; J. L. Horsfall, Yonkers, N. Y.; C. C. Hamilton, New Brunswick, N. J.; Mr. and Mrs. L. A. Stearns, Ironton, Ohio; W. J. Schoene, Blacksburg, Va.; L. P. Detman, College Park, Md.; William Middleton, East Falls Church, Va.; Thomas J. Headlee, New Brunswick, N. J.; R. A. Pearson, College Park, Md.; G. F. MacLeod, State College, Pa.; G. W. Underhill, Richmond, Va.; M. P. Zappe, New Haven, Conn.; H. S. McConnell, College Park, Md.; Henry W. Reiblich, Agatha A. Reiblich, Woodlawn, Baltimore Co., Md.; L. E. Dills, Inwood, W. Va.; H. E. Hodgkiss, State College, Pa.; L. M. Peairs, Morgantown, W. Va.; L. M. Berthalf, J. W. Bulger, J. L. Webb, Washington, D. C.; W. S. Hough, Winchester, Va.; Neale F. Howard, Columbus, Ohio; T. C. Shinghiff, J. Walter Englar, New Windsor, Md.; S. W. Frost, Arendtsville, Pa.; E. N. Cory, College Park, Md.; T. L. Guyton, Harrisburg, Pa.; A. L. Quaintance, L. M. Benhalf, Washington, D. C.; F. W. Poos, Norfolk, Va.; L. J. Bottener, Vienna, Va.; Wallace Colman, Washington, D. C.; W. S. Abbott, A. G. Kenyon, W. N. Davidson, and T. J. Schnederham, Vienna, Va.; K. E. Dills, Inwood, W. Va.

The Hudson River Valley was chosen as the meeting place for 1928. Prof. P. J. Parrott was elected as President; M. D. Leonard, Secretary.

ENDOWMENT FUND NEWS

The committee on endowment will publish from time to time the latest news under this heading in the Journal.

At the last annual meeting of the Association it was voted on recommendation of the Committee on Policy, that the President appoint a committee to take charge of raising an endowment. It was also voted that life membership fees might be paid in installments that could be spread over a period of five years. (See p. 14–15, Journal of Economic Entomology, Vol. 20, No. 1, February 1927.) President Harned has appointed the following committee to take charge of this work: A. F. Burgess, Chairman, George A. Dean and J. G. Sanders. It is desired that every member shall do all in his power to make this effort a success.

Need For an Endowment

During recent years the membership of the Association has grown steadily until more than 900 are now enrolled. The Journal of Economic Entomology which is owned and operated by the Association is being constantly enlarged, the number of printed pages having increased 42% during the past six years.

The work required to handle the details incident to enlarged membership and increased scope of publication is becoming so heavy that within a few years the Association will face a serious situation unless provision is made to adequately care for these needs. This condition together with the proper care of the finances is important but does not represent the most vital needs of the organization.

Entomology is expanding rapidly and with this expansion it is becoming more specialized each year. This is causing entomologists to establish more intimate contacts with other sciences and with the business world. Such developments are logical and will continue and increase as time goes on.

If this Association is unable to hold the interest and allegiance of the entomologists throughout the country and by so doing speak with authority for the science it represents, a general breakdown will result and the elements that should be held together will gradually shift about and affiliate with other activities. What is necessary is a strong unified organization capable of coordinating and holding the interest of specialized fields as they are developed. Progress along these lines requires unceasing toil and careful planning and will soon become so complex that the best results cannot be properly secured without a permanent organization.

We are approaching this condition of affairs and provision should be made without delay to meet the situation in advance of urgent need. The Association is of great value to entomology as a common meeting ground for both State and Federal workers and for all entomologists interested in insect problems. Its usefulness can be greatly increased with material benefit to all concerned.

A fund of $200,000 or possibly more will be necessary to afford sufficient income to maintain a permanent establishment and do effective work. The committee will invite one member from each State and each Province of Canada to organize the members in his own territory in order to make this effort a success. Each member is urged to do his utmost to assist the district representative and the committee.

A. F. Burgess, *Chairman*

FORTIETH ANNUAL MEETING OF THE AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

Nashville, Tenn., December 27 to 31, 1927

The 40th annual meeting of the American Association of Economic Entomologists will be held at Nashville, Tenn., on the above-named dates.

The schedule for the program has been arranged as follows:

Tuesday, December 27, 9:30 a. m., Section of Plant Quarantine and Inspection; 1:30 p. m., same section, program continued; 3:00 p. m., Section of Apiculture.

Wednesday, December 28, 9:30 a. m., Section of Apiculture, continued; 1:30 p. m., Opening Business Session of the General Association and Address of the President; 7:00 p. m., Entomologists Dinner.

Thursday, December 29, 9:30 a. m., Session of the General Association; 1:30 p. m., Joint Session of General Association and Cotton States Branch; 8:00 p. m., Meeting of the Extension Entomologists and Insect Pest Survey.

Friday, December 30, 9:30 a. m., Session of the General Association; 1:30 p. m., Session of the General Association.

Saturday, December 31, 9:30 a. m., Session of the General Association, including final business.

Headquarters for the entomologists will be at Hotel Hermitage, Nashville. Rates as follows:

Single rooms	$2.00, 2.50 and 3.00 in the Open Court;
Single rooms	$3.50 and 4.00 on the outside of the Bldg.;
Double rooms	$4.00 and 4.50 in the Open Court;
Double rooms	$5.00 and 6.00 on the outside of the Bldg.

All rooms have private bath.

There are quite a number of outside rooms that are connecting, each with private bath, and each containing twin beds. The rate on these rooms are $2.50 per person, two persons to the room. There are also large rooms available which accommodate 3 or more persons where a rate of $2.00 per person is quoted.

We are advised by the management that it will be impossible to let but few single rooms, so would advise that members registering either make previous arrangements to double up with someone or be prepared to arrange such on arrival at the hotel.

It is advisable that members expecting to attend the meeting make their reservations very early so that we can have as many entomologists as possible quartered in the hotel headquarters. I understand that other societies intend to make this hotel their headquarters.

Members desiring to submit titles for the program of the general sessions are urged to present subjects which are of broad, general interest. At the last meeting it was voted that papers be presented in concise form rather than in detail. The time will be limited to **5 minutes.** This will give more opportunity for general discussion. All titles must be in the hands of the Secretary not later than **NOVEMBER 10.** This will make it possible for the program to be printed and appear in the December number of the Journal to insure its distribution before the meeting. Members are requested to prepare and submit with their title an abstract of three or four printed lines indicating the facts contained in the paper, so that it can be included in the program. A longer abstract should be submitted with the paper for publication in the Journal.

In that the opening business session usually requires considerable time, it is recommended that Chairmen of Committees submitting reports make them brief—so as to save as much time as possible.

Application for membership should be filed as soon as possible and must be accompanied by fee of $4.00. Blanks can be secured from the Secretary or from the chairman of the membership committee.

If you intend to present a paper at the meeting, **please forward the title promptly.**

R. W. HARNED, President,
A. & M. College, Miss.

C. W. COLLINS, Secretary,
Melrose Highlands, Mass.

October 1, 1927

JOURNAL OF ECONOMIC ENTOMOLOGY

OFFICIAL ORGAN AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

OCTOBER, 1927

The editors will thankfully receive news matter and other items likely to be of interest to our readers. Papers will be published as far as possible in the order of reception, except that papers of reasonable length may be accepted in the discretion of the editor for early publication at $2.50 per page for all matter in excess of six printed pages, a part page counting as a full page, this limit not including acceptable illustrations. Photo-engravings may be obtained by authors at cost.

Separates or reprints, if ordered, when the manuscript is forwarded, will be supplied to authors at the rates given below. Note that the number of pages in a reprint may be affected somewhat by the make-up, and that part of a page is charged as a full page. Carriage charges extra in all cases. Shipment by parcel post, express or freight as directed.

One hundred separates or reprints at $1.50 per page or plate. Additional hundreds or less, 4 pages or less, $1.00; 5–8 pages, $1.50; 9–12 pages, $1.75; 13–16 pages, $2.00; 17–24 pages, $3.00; 25–32 pages $4.00. Covers suitably printed on first page only, 100 copies, or less, $4.50; additional hundreds, or less, $1.75. Plates inserted, $1.75 per hundred or less. Folio reprints, the uncut folded pages (50 only), sixteen page signature, or less, $3.00. A discount of 10 per cent and 20 per cent from the above prices will be allowed on orders of 500 and 1000 reprints respectively.

The annual meetings are an exceedingly important part of our professional activities. They serve as a general clearing house for information and do more than any other agency to promote mutual understanding—a necessity to efficient cooperation. This last is imperative in a group dealing with the exceedingly varied and complex matters falling within the province of the economic entomologist. Special attention is therefore called to the discussion of methods of improving our meetings given elsewhere. The subject is worthy of very careful study. It is probable that no one man can offer an entirely satisfactory plan for bettering conditions. It is hoped that all will study the plan outlined by Professor Smith and take up the discussion in a friendly spirit leading to constructive modifications of our present plan, if such be possible.

The fundamental problem is one of publicity and in the case of our meetings, the aim is to acquaint professional colleagues with the latest developments. There is not time, there never can be time, to give all the details. There are too many investigators, too many lines of work in economic entomology, to make this possible. The judge of a court insists upon a brief and the higher the court, the briefer must be the brief. Our annual meetings are in a way the court of last resort. Let us submit briefs adapted to conditions. These may be vocal, written or even exhibits. There is no one method equally applicable to the results obtained by all workers.

Another phase of publicity is becoming more acute as time passes, namely publication facilities. The JOURNAL is the official organ of the

Association and as such publishes the annual proceedings. These, notices of branch and sectional meetings and papers presented at these require a constantly increasing amount of space. Not all the papers read by title at the last meeting can be published in this or earlier issues. The independent papers are at an even greater disadvantage and it is usually necessary to hold them a number of months, more than a year in some cases. Not a few authors have found it necessary to meet personally the cost of matter over-running our six page limit. A few papers have been printed without delay when the author was able to arrange for meeting the entire cost of publication of the matter. The obvious remedy would be more money for publication and early printing would in a measure aid in solving the program difficulty of the annual meeting.

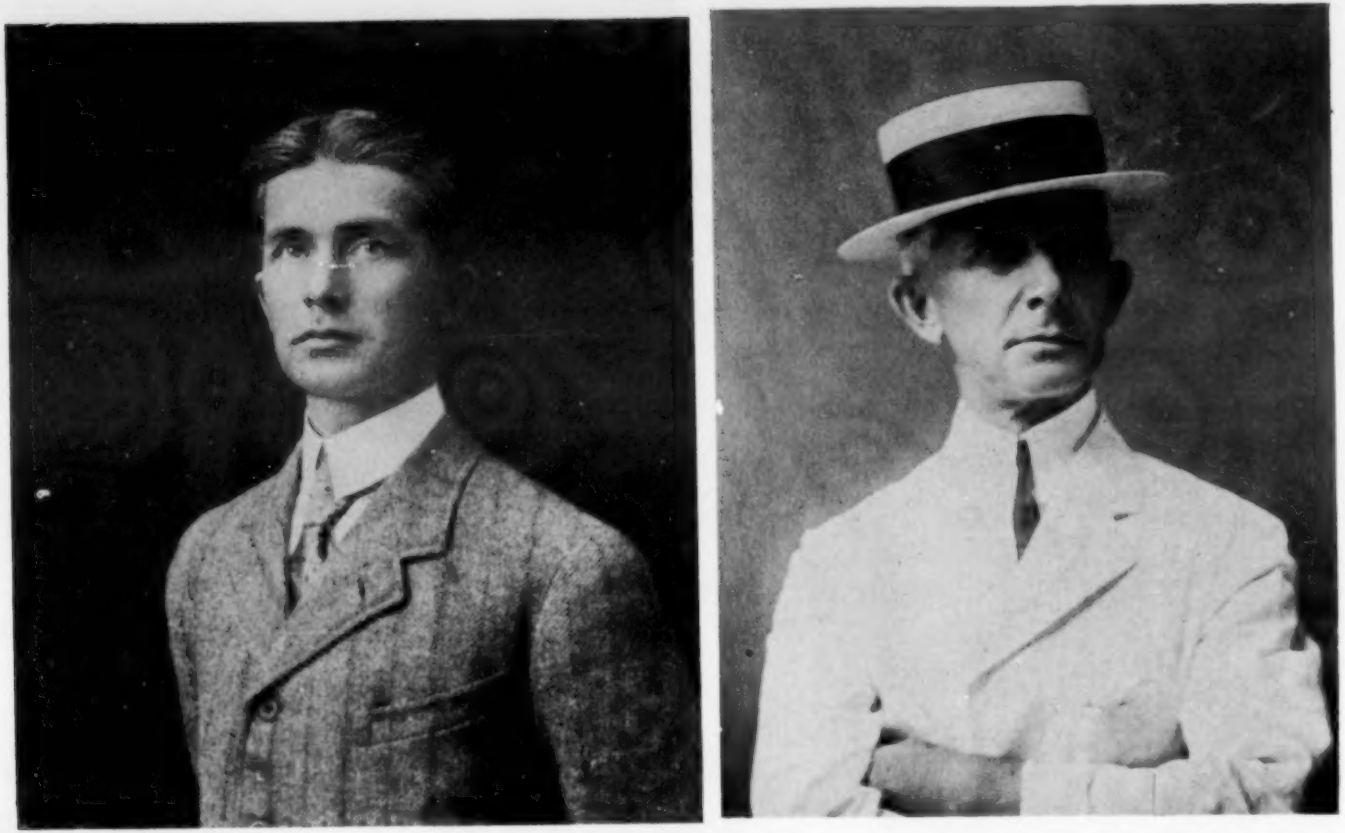
Obituary

CHARLES FULLER BAKER

Charles Fuller Baker, entomologist, botanist, agronomist, collector, teacher, agricultural director and dean, died at St. Luke's Hospital in Manila, Philippine Islands, on July 22, 1927, aged fifty-five years. According to word received from D. L. Crawford, "his death was due to chronic dysentery which became acute and confined him in the hospital for two weeks before the day of his death." It is a comfort to his friends to know that during his illness he was attended by one of his own students, Doctor Leon Gardner of the Sternberg Hospital in Manila. He was buried on the campus of the University of the Philippines where he spent the last nine years of his arduous life. He was born at Lansing, Michigan, March 22, 1872, the second son in a family of ten children, and was the brother of the noted author, Ray Stannard Baker, and the forester, Hugh Potter Baker.

At the Michigan Agricultural College, from which he graduated in 1892, he came under the instruction of Prof. Albert John Cook who exerted a profound influence upon his studies in entomology and botany as well as upon many of his later activities in life. Prof. Cook once told me that Baker, when a student at college, spent all of his cash for insect boxes and by the time he graduated he had several hundred boxes of specimens, a larger and more complete collection than was at the college at that time. As an undergraduate he assisted Prof. Cook from 1891–1892 when he was transferred as assistant to Prof. C. P. Gillette at the Colorado Agricultural College, Fort Collins, Colorado

The portrait on the left was taken during his stay at Pomona College, Claremont, California, [illegible] celebration of his fifty-third birthday, March 22, 1925, when he was at the University of the Philippines, Los Banos, P. I.



CHARLES FULLER BAKER

The portrait on the left was taken during his stay at Pomona College, Claremont, California in 1909; that on the right on the celebration of his fifty-third birthday, March 22, 1925, when he was at the University of the Philippines, Los Banos, P. I.

Here he made very extensive botanical and entomological collections and began publishing. One of his first important contributions was "A preliminary list of the Hemiptera of Colorado"[1] in co-authorship with Prof. Gillette. Most of his earlier papers dealt with the Homoptera and particularly the Cicadellidae. It was in this publication that he described the sugar beet leafhopper, *Eutettix tenellus*, as *Thamnotettix*.[2] In 1893 he was in charge of the Colorado foresty and zoological exhibit of the Columbian Exposition at Chicago. The years 1897–1899 were spent partly in Alabama where he acted as zoologist in the Alabama Polytechnic Institute and entomologist in the Agricultural Experiment Station. Here he was connected with the Alabama Biological Survey. During 1898–1899 he was botanist on the H. H. Smith[3] exploring expedition in the Santa Marta Mountains, Colombia. In 1899–1901 he was a teacher of biology in the Central High School at St. Louis, Missouri. Following this he studied with Prof. Vernon L. Kellogg at Stanford University where he obtained the degree of Master of Science in 1903.

Through the efforts of Prof. Cook, Baker was induced to accept the position of Assistant Professor of Biology at Pomona College in 1903, but he remained there only one year. During this year he edited Invertebrata Pacifica[4]

He left California to become Chief of the Department of Botany of the Cuban Experiment Station (Estación Agronómica), Santiago de las Vegas, Cuba, which position he held from 1904 until 1907. During this very busy period also he published two very important papers on the then little known fleas of North America.[5] From Cuba he went to Brazil to assume the position as Curator of the Herbarium and

[1]Bul. No. 31, Tech. Ser. No. 1. Colorado Agr. Exp. Sta., Ft. Collins, Colo., 137 p. 1895.

[2]The generic position of this insect is still questioned by systematists.

[3]Celebrated entomological explorer and collector.

[4]This serial appeared as follows: Homoptera, Vol. 1, p. 1–12, Sept. 15, 1903; Orthoptera, p. 13–16, Nov. 30, 1903; Diptera, p. 17–40, Feb. 10, 1904; Hymenoptera, p. 41–70, Aug. 26, 1904; Orthoptera, p. 71–84, Jan. 30, 1905; Neuropteroid Insects, p. 85–92, May 15, 1905; Hymenoptera, p. 93–110, Aug. 20, 1905; p. 111–132, Oct. 27, 1905; Heteroptera, p. 133–140, Jan. 24, 1906; Hymenoptera, p. 141–159, May 24, 1906; p. 161–178, Feb. 28, 1907; p. 179–198, Oct. 8, 1907. It was begun at Claremont, Calif., and completed (p. 71–198) during his stay at Santiago de las Vegas, Cuba. It contained descriptions of insects which he collected personally, mostly in Califronia and Nevada. A part of his insect collection containing types and paratypes of many of these is at Pomona College along with many exotics collected in Cuba and Brazil.

[5]Rev. Am. Siphonaptera. Proc. U. S. Nat. Mus., Vol. 27, p. 1–365, 1904. Classification of N. A. Siphonaptera. Ibid., Vol. 29, p. 1–121, 1906.

Botanical Garden, Museu Goeldi at Para, where he stayed one year. In Brazil he amassed very large collections of both plants and insects which were presented to Pomona College upon his return there in 1908. It was at the beginning of my junior year in college there that I came under his singular guidance. With the enthusiasm, confidence and untiring cooperation of Prof. Cook, he accomplished a remarkable piece of work at that institution. His influence upon students was very unusual and he stimulated the most backward to produce surprising results. Many things,—equipment, housing facilities, money, were needed to supply him. These were secured by Prof. Cook, either directly from the College or from private individuals. Entomology at once forged ahead of all other biological sciences. Systematic and life history work became fundamental. For the citrus fruit growers of the region a system of orchard inspection was organized which gave not only excellent field experiences, but remunerative employment for advanced students, and rich returns to the growers. During his four years' stay there he inspired, trained and sent out a fairly large group of biologists in consideration of the small size of the institution at that time.[6]

Early in 1909 he explained to Prof. Cook the great need of serial publications, not only as an outlet for the work of students and specialists, but also for the benefit of all interested in the biological sciences, especially entomology and botany. Prof. Cook at once agreed and undertook, single-handed, to raise sufficient money by private subscription to finance first a Journal of Entomology[7] and then a Journal of Economic Botany.[8] The former appeared in March 1909, and the latter in February 1911. Another notable contribution was the publication of the First Annual Report of the Laguna Marine Laboratory[9]

[6]Among this group were Charles W. Metz, J. E. Graf, D. L. Crawford, B. L. Boyden, C. F. Stahl, H. J. Ryan, F. R. Cole, A. R. Davis, John A. Prizer, R. S. Vaile, A. R. Baird, H. A. Weinland, Harry V. M. Hall, Gertrude Bacon (Mrs. H. L. Chaffee), Vinnie E. Stout (Mrs. B. P. Aborn), Blanch E. Stafford (Mrs. Charles W. Metz), Leon Gardner, Sarah R. Atsatt.

[7]Baker edited Vol. 1 (1909) through no. 2, Vol. IV (1912). When Dr. W. A. Hilton succeeded as head of the department of biology and editor of the scientific journals he changed the name to Journal of Entomology and Zoology, beginning with Vol. V (1913).

[8]The Journal of Economic Botany edited by Baker continued through three volumes, I (1911), II (1912), III (1913). Its discontinuance was announced in nos. 3 and 4, Vol. III, Dec. 1914, by D. L. Crawford, then Professor of Botany at Pomona College.

[9]Published by the Department of Biology, Pomona College, Claremont, Calif. 218 p., 130 fig.

in 1912. The Pomona College marine station at Laguna Beach was organized almost entirely through the efforts of Professors Cook and Baker with financial assistance from a few local residents, and it is still ably conducted by Dr. Hilton.

In October 1911 the appointment of Prof. Cook as Horticultural Commissioner of California broke the magic ring of activities at Pomona. When he removed to Sacramento there was no one left to solicit the necessary funds to continue the work which was more than could be assumed by the College. Certain restrictions were also made to prevent outside solicitations for aid which appeared to handicap permanently the future development of the important work so gloriously started. After a year of disappointment Baker finally decided to accept the position of Professor of Agronomy at the University of the Philippines which was offered him by his good friend Dean E. B. Copeland, whom he succeeded in 1918. During his long stay in the Philippines he left only once and that was for a year's leave of absence in 1917–1918 to become assistant director of the Botanic Gardens at Singapore. Every ounce of vitality was poured into his work. His entomological collections received the greater part of his spare time. He maintained at his own expense a Cuban collector named Julian Hernandez whom he carefully trained and kept with him after he left Cuba in 1907. This man spent all of his time either collecting or caring for the insects, or in the domestic duties of a bachelor's household. Botany came in for a share also and fungi in particular were taken extensively throughout the Archipelago. Every cent of his salary that could be utilized went towards building up the collections. Concerning these he writes under date of April 27, 1925: "My outside work in entomology and mycology is the only thing that gives me any real satisfaction: that, at least, is done as it ought to be done and I can go on and develop it to the limit of personal possibilities without let or hindrance from anyone. I have pushed the number of foreign specialists engaged on our work up to one hundred ten, and keep them all busy! It thus has become one of the biggest projects of its kind in the world. And its ultimate permanent contribution to entomology will be very, very large. And this helps very materially to make the stay here worth while."

Failing health and gradual replacement of American teachers and investigators by Filipinos many times influenced him to desire to give up his position in the Philippines and seek a place of complete change and a haven of peace and quiet in America where he could find space to house and work on this large insect collection during the remaining years of his life. To this end an attempt was made to secure for him

a place at the California Academy of Sciences, but the difficulty of raising a proper endowment indefinitely delayed action until it is now too late. On August 30,1925 he wrote: "The outside work I am carrying constantly looms larger and larger and it makes me want to stay here. But poor health will probably force me to cut loose ere long."

For several years he was considering an offer from a strong combination of all the entomological interests of the Hawaiian Islands to conduct extensive work in the western Pacific Islands,— "Over Wallace's Trail." His failure to negotiate terms in California and the opportunities offered by his own student, President Crawford, of the University of Hawaii, led him finally to accept the Hawaiian offer. Accordingly, he presented his resignation to the College of Agriculture, University of the Philippines, Los Banos, Laguna, P.I., to take effect in November 1927. In *Science*,[10] it is stated that "he expects to spend next year with one of the Pan-Pacific research committees on the South Sea Survey and thereafter will make headquarters at the University of Hawaii with President David Crawford. Arrangements have been made to house his large collection of natural history material at the Bishop Museum." On June 9, 1927 the Board of Regents of the University of the Philippines passed a resolution appointing him Professor of Tropical Agriculture and Dean Emeritus of the College of Agriculture of the University of the Philippines, and also Director Emeritus of the Experiment Station, effective December 1, 1927. His untimely death came before this much earned public recognition was realized.

His insect collection is a remarkable achievement amassed over a period of fourteen years of unremitted labor. From reports received from Baker in 1926 it contained approximately four hundred thousand specimens. On November 9, 1926 he wrote me concerning it: "The collection is undoubtedly the largest existing private collection covering extreme western Pacific. The pinned part of it is contained in one thousand five hundred cases, all crowded full. But as much more has been placed in the hands of one hundred ten (later one hundred fifteen) specialists[11] and considerable portions of the latter will be returned. I believe it is one of the most important collections *basic* to either Central and South Pacific work or to Southwest Asian studies since it

[10]Vol. LXVI, no. 1699, p. 77, July 22, 1927.

[11]Some of the specialists who were supplied with entomological material by Baker are: **Coleoptera**—Hans Gebien, R. Kleine, and A. Zimmermann, Germany; A. Boucomont, Ed. Fleutiaux, A. Grouvelle, and M. Pic, France; Jan Obenberger, Czecoslovak; H. Krekich-Strassoldo, Austria; Chr. Aurivillius, Sweden; H. E.

includes several thousand types and cotypes. Moreover, more material is constantly coming in and I have so arranged it that continued collections on a large scale will be made after I leave here. I also have a lot of fine Australian material constantly coming in. Moreover, I have taken the fullest advantage of exchange possibilities, making important exchanges with European museums and with individuals, in this way securing a vast number of species I lacked, many of these being cotypes."

According to S. A. Rohwer, information received by Dr. L. O. Howard from Baker indicates that the insect "collection is considerably larger than it was in November 1926, as Baker received from specialists quite a little material during the winter of 1926–27 and also continued to mount miscellaneous material which had been collected. The figures for the number of cases undoubtedly referred to the pinned part only. From information and letters, I gather that there is probably half as many specimens that are unmounted." All the mounting, labeling, packing and shipping to specialists was done by Baker himself at night, the entire work including the salary of the collector already referred to, cost of pins, boxes, labels, packing and postage, was supported by his modest salary, yet, as he states, "if one lives simply and rigorously as a Trappist monk, many things may be possible." According to his long-standing will, the main insect collection was bequeathed to the U. S. National Museum. The statement that small parts were also donated to the Universities of Berlin, London, Madrid, Paris, Moscow, and Vienna,[12] is probably erroneous. Crawford states that "he (Baker) was stricken so suddenly by this accute attack of dysentery that he had no time to make any changes in his will .... and according to cable information received from Manila his old will still stands whereby the U. S. National Museum is to receive his main insect collection and the University of the Philippines is to receive his main collection of plant material." Rohwer also states that "the will provides that the entire collection, manuscripts and notes, should come to the National

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Andrewes and Guy A. K. Marshall, England; Edward A. Chapin, United States. **Orthoptera**—Achille Griffini, Italy; H. H. Karny, Dutch East Indies; A. N. Caudell, United States. **Homoptera**—Frederick Muir and D. L. Crawford, Hawaii; L. Melichar, Moravia; W. D. Funkhouser and T. D. A. Cockerell, United States. **Hemiptera**—W. L. McAtee and J. R. Malloch, United States. **Diptera**—P. Sack, Germany; W. S. Patton, Scotland; M. Bezzi, Italy; J. R. Malloch and G. F. Ferris, United States. **Hymenoptera**—E. A. Elliott, England; H. L. Viereck, Canada; T. D. A. Cockerell, United States. Baker worked chiefly in Homoptera on the Jassoidea, Fulgoridae, and Cercopidae, and in the Hymenoptera on the parasitic Braconidae, during his stay in the Philippines.

[12]Science, Vol. LXVI, no. 1701, p. 129. Aug. 5, 1927.

Museum. We have never been advised that there were any changes. The museum is planning to make arrangements to have the collection transferred to Washington as soon as practical after the will is probated."

Entomology and mycology were only side issues or hobbies, his real work was the development of agriculture in the Philippines. A perusal of files of the Philippine *Journal of Science*[13] and more particularly the Philippine *Agriculturist* and Philippine *Agricultural Review*, the last two of which he was associate editor, will give something of the results accomplished. Concerning this broader work the following editorial of the *Tribune*[14] [illegible]timent: "The Baker Leadership! The University of the Philippines can ill afford to lose the services of Dean Charles F. Baker of the College of Agriculture. He has made of his college an institution of the highest standing in this country and one to which recognition abroad has been deservedly given. The Los Banos unit of the University (is) what it is because Dean Baker has put in its organization and management much of his own forceful personality and transferred to the faculty his own enthusiasm for its mission.

"The work of bringing advance methods of agricultural practices to the people on the farms has only been started. It is the work not for a decade but for a generation. In this task Dean Baker has been easily a recognized leader. It is not too much to say of him that, were he to leave the college permanently, the Baker leadership will yet be felt through years to come. It is a measure of his success that what is often good in scientific agriculture may be traced to a Baker tradition."

Baker was a member of the American Association for the Advancement of Science, American Association of Economic Entomologists, Entomological Society of America, Washington Entomological Society, Southern California Academy of Sciences, and the Havana Academy.

Although he died comparatively young, he did the life work of ten men.

E. O. Essig, *University of California, Berkeley, California, August 15, 1927.*

[13] In this journal were published the results of much of the entomological work done by Baker and his large corps of specialists to whom he forwarded his material.

[14] Independent Filipino Daily, Carlos P. Romulo, editor, Manila, P. I., p. 4, Nov. 6, 1926.

Reviews

All entomology is economic. We are dealing not with isolated, pestiferous insects but with such species in a biological complex which may never be fully understood. We must know the fauna and for that matter the flora also. The two works reviewed below are comprehensive attempts to crystallize information about certain groups.

General Catalogue of the Hemiptera, Fascicle 1, Membracidae by W. D. FUNKHOUSER. Published by Smith College, Northampton, Mass., pp. 1–581, 1927.

This is the first part of a much needed world catalogue of this important group. It lists the species, indicates the synonymy, includes the more important references with indications of their character, and gives the recorded distribution. It is a ready index to the genera, species and literature of this none too well known order and therefore valuable to every working entomologist giving attention to the Hemiptera. No attempt has been made to indicate relationships beyond the subfamilies except in the Smilinae. The species are arranged alphabetically under each genus. Each species is recorded under every genus in which it has been placed with the correct reference. The bibliographies for genera and species are chronological. The general bibliograpy is arranged by authors, the various citations chronological. The initial fascicle promises well for the series to follow. The author is to be congratulated upon having completed a valuable contribution to science in such an admirable manner.

E. P. FELT

Guide to the Insects of Connecticut, Part V, The Odonata or Dragonflies of Connecticut by PHILIP GARMAN, Conn. Geol. and Nat. Hist. Surv., Bul. 39, pp. 1–331, 1927.

This is a worthy addition to the series on insects started in 1911 and comprising, in addition to the Introduction by Dr. Britton, volumes on the Euplexoptera and Orthoptera, Hymenoptera and Hemiptera. May the series be completed in the not distant future.

There is much to commend in this latest addition. The introduction is a model of comprehensiveness and conciseness. The systematic portion contains keys for adults (both sexes) and nymphs of genera and species, as well as descriptions of the sexes and nymphs and distributional records. The numerous excellent illustrations add greatly to the value of the text. There is a well selected bibliography, a glossary and an excellent index. The author records 48 genera and 112 species, of these professional predators from Connecticut. There should be more works like this in other states and in many groups if we are to know insects as they should be known

E. P. FELT

Current Notes

Professor T. D. A. Cockerell is traveling in Russia and Siberia and reached Leningrad on July 10.

Mr. James A. Hyslop has been elected president of the Entomological Society of Washington for 1927.

Dr. S. Marcovitch is now back at Knoxville, Tennessee, after completing his graduate studies at the University of Minnesota.

Mr. H. K. Riley, a graduate of Iowa State College, has accepted a position as assistant entomologist at Purdue University.

Mr. W. W. Stanley, graduate of Montana Agricultural College, has been appointed assistant entomologist at the Tennessee Experiment Station.

Dr. H. H. Stage, Entomologist of the Cotton Belt Railway, Pine Bluff, Arkansas, was a visitor at Entomological Branch Headquarters, Ottawa, on July 29.

Mr. R. A. Cushman of the U. S. National Museum spent June 20 to 24 in Philadelphia, studying types of Ichneumonidae at the Academy of Natural Sciences.

Mr. M. D. Farrar, Instructor of Zoology and Entomology, South Dakota Agricultural College, is taking graduate work in entomology at Iowa State College.

Recent appointments in the Entomological Branch, Canadian Department of Agriculture, are announced as follows: Temporary Insect Pest Investigators, W. C. Bourne, Fredericton Laboratory, F. W. Barnes, Lethbridge Laboratory.

Mr. F. E. Whitehead, Associate Professor of Entomology, University of Idaho, has been granted a leave of absence to take graduate work in entomology at Iowa State College.

Dr. E. A. Back, of the Bureau of Entomology, attended the convention of the National Furniture Warehousemen's Association held in the Grand Hotel, Mackinac Island, Michigan, July 8 to 13.

Dr. R. B. Friend and Mr. J. Peter Johnson of the Connecticut Agricultural Experiment Station visited the Asiatic beetle field station at Westbury, Long Island, N. Y., on July 27.

Mr. R. S. Filmer, a recent graduate of the Connecticut Agricultural College, has been appointed Junior Entomologist, Bureau of Entomology, and will assist in the studies on stomach poisons.

W. Gamkrelidze, a graduate of the University of Paris, has been appointed Specialist in Parasites in the Bureau of Entomology, and assigned to the European parasite Laboratory, Hyères (Var) France.

Mr. G. Stuart Walley, of the Department of Agriculture of Canada, is taking graduate work in entomology at Iowa State College. Mr. Walley is doing some special work in insect morphology.

The degree of Doctor of Philosophy in Entomology was conferred upon Mr. C. R. Jones, Associate Professor of Entomology, Colorado Agricultural College, Fort Collins, Colorado, at the June Commencement of Iowa State College.

Prof. O. W. Rosewall, head of the entomology department of Louisiana State University, has been granted a year's leave of absence in order to take graduate work in entomology at Iowa State College.

Messrs. M. H. Brunson of the Pee Dee Boll Weevil Laboratory, Florence, S. C., and Roy Melvin of the Mississippi A. & M. College, are taking graduate work in entomology at Iowa State College.

According to *Science*, Mr. W. L. McAtee has returned from Europe where he spent three months on official business connected with the Bureau of Biological Survey and the Bureau of Entomology.

The degree of Doctor of Science has been conferred by De Pauw University on Dr. William Albert Riley, head of the department of animal biology of the University of Minnesota.

The offices and laboratories of the department of entomology at the University of Illinois have recently been moved into new quarters in the building formerly occupied by the College of Law.

A new animal science building is to be erected by California University and Station at Davis, to cost $300,000. This will house the division of entomology and parasitology and several other departments.

Dr. Garry DeN. Hough, a physician, and former student of the Muscidae, died at Vineyard Haven, Massachusetts, on May 31, 1927. Dr. Hough published several taxonomic papers in *Entomological News* thirty years ago.

Mr. R. A. Roberts, graduate of Texas A. & M. College, is taking graduate work in entomology at Iowa State College. Mr. Roberts has been assisting Dr. F. C. Bishopp of Dallas, Texas, during the past summer.

Mr. Harold H. Shepard, who has recently received the degree of Master of Science from the Maryland University, has been appointed Assistant Entomologist in the Bureau of Entomology. He will assist in the work on contact insecticides.

Visitors at the laboratories of the Department of Entomology at the Kansas State Agricultural College during July included Professor R. W. Harned of Mississippi, Professor W. C. O'Kane of New Hampshire, and Mr. J. R. Horton of the Bureau of Entomology; during August, R. L. Webster, Pullman Wash.; J. S. Houser, H. L. Gui, and G. A. Filinger of Wooster, Ohio; F. E. Whitehead, Moscow, Idaho, and D. B. Whelan, Lincoln, Nebr.

Dr. F. C. Craighead of the Bureau of Entomology left Missoula, Montana, on July 16 for Coeur d'Alene, Idaho. From the latter point he proceeded to the Colorado National Forest, where studies of the Black Hills beetle are being conducted.

Professor William E. Hoffmann, head of the biology department of Lingnan University, Canton, China, has been sent by that institution to the Philippine Islands where he is to spend two months investigating insect problems common to South China and the Philippines.

Messrs. L. H. Worthley, Toledo, Ohio, Dr. S. B. Fracker, Washington, D. C., R. A. Sheals, Providence, R. I., A. F. Burgess, Melrose Highlands, Mass., Loren B. Smith, J. L. King, R. W. Sherman, Riverton, N. J., and R. A. Vickery, Stratford, Conn., are among the recent callers at the Department of Entomology, Agricultural Experiment Station, New Haven, Conn.

Messrs. Ralph Hopping, E. R. Buckell, Arthur Kelsall, W. Downes, E. P. Venables, and A. A. Dennys of the Entomological Branch, attended the meetings of the Western Horticulturists, Entomologists and Plant Pathologists held at Pullman, Washington, and Moscow, Idaho, from June 24 to July 3.

The Egyptian Government has advertised for economic entomologists to fill three positions: (1) Chief of division, salary $10,000; (2) Assistant Chief, salary $5,000; (3) salary $3,000. It is understood that American men of scientific training and ability will be welcomed in Egypt.

Professor A. E. Stene, State Entomologist of Rhode Island, and Harry Horovitz, Superintendent of Field Work in the Rhode Island State Department of Agriculture, recently conferred with members of the Japanese Beetle Laboratory force, Riverton, New Jersey, relative to present research methods and results.

Mr. Arthur Kelsall of the Annapolis Royal, N. S. laboratory, returned the last of July, after having completed an extensive trip through the southern part of the Dominion as far west as the Pacific Coast, gathering data at the various entomological laboratories for use in future insecticide investigations.

Mr. D. J. Caffrey returned to headquarters at Arlington, Mass., on July 2, after spending the greater part of April, May, and June in the Middle West, in connection with the corn borer clean-up campaign and the various corn borer research projects under way in that section.

Dr. S. P. Minkiewicz, Entomologist of the Institute for Agricultural Research, Pulawy, Poland, spent the first week of September at the Kansas State Agricultural College, conferring with the members of the staff of the Department of Entomology on projects, organization and methods of conducting research work.

The directors of the Texas Pecan Growers Association at their annual meeting held July 12 at Gonzales, Texas, awarded the distinguished service medal to Dr. S. W. Bilsing for his research work on the life history and control of the pecan nut case bearer (*Acrobasis caryae*).

On June 28, Mr. J. L. King started the parasite introduction for the control of *Anomala orientalis* at Westbury, Long Island. A number of female *Tiphia vernalis* were introduced at this time. Mr. H. C. Hallock, formerly of the Japanese Beetle Laboratory, will have charge of the rearing work on Long Island.

The following recent transfers in the Bureau of Entomology have been announced: C. H. Griffith, Twin Falls, Idaho, to Corvallis, Oregon; J. U. Gilmore and S. F. Grubbs, Clarksville, Tenn., to Appomattox, Va.; S. E. Crumb and K. B. McKinney, Clarksville, Tenn., to Lexington, Ky.; F. A. Fenton to pink bollworm, El Paso, Texas.

The insecticide unit of the Division of Deciduous Fruit Insect Investigations, Bureau of Entomology, at Washington, D. C., has recently been enlarged to include investigations on stomach poisons, in addition to the work on contact insecticides already under way. These investigations have been placed under the direction of Dr. C. H. Richardson.

Recent visitors at the Monroe, Michigan corn borer laboratory of the Bureau of Entomology included Professor H. F. Wilson of the University of Wisconsin; Professor J. J. Davis and Dr. Kraybill of Purdue University; Professor C. W. Woodworth of the University of California, and Dr. Herbert Osborn and Herbert Osborn, Jr., of the Ohio State University.

Mr. V. I. Safro has been appointed Director, Japanese Beetle Suppression, by the New Jersey State Department of Agriculture, with office at Trenton, N. J., and field headquarters at the Japanese Beetle Laboratory, Moorestown, N. J. Control work will be conducted in close cooperation with the Japanese Beetle organization of the U. S. Bureau of Entomology.

Dr. F. L. Campbell, formerly Assistant Professor of Biology, New York University, has been appointed Associate Entomologist in the Division of Deciduous Fruit Insect Investigations, Bureau of Entomology. He has been placed in charge of investigations on arsenical substitutes and on the toxicology of stomach poisons at Washington, D. C., under the general supervision of Dr. C. H. Richardson

Messrs. Walter Carter, of Twin Falls, Idaho, and R. E. Campbell, of Alhambra, Calif., attended the meetings of the Pacific Slope Branch of the American Association of Economic Entomologists held at Reno, Nevada, June 22 to 25. From Reno Mr. Carter went to Berkeley and other points in California to confer with State officials regarding investigations on the sugar-beet leafhopper.

On July 5, a conference regarding insects was held at Sacramento, Calif. Among those present were Lee Strong, of the California State Department of Agriculture, D. K. Gradv of San Francisco, Secretary of the California Dried Fruit Association, Perez Simmons and W. D. Reed, of the Bureau's laboratory at Fresno, Calif., and Professor W. C. O'Kane of the Crop Protection Institute.

Mr. A. B. Baird, of the Chatham, Ontario laboratory, reports that larch sawfly parasites of the species *Mesoleius tenthredinus* have been emerging since early June from larch sawfly cocoons shipped to the laboratory from Treesbank, Manitoba, by Mr. Norman Criddle. Numbers of these parasites have already been liberated in the Provincial Forest Nursery at St. Williams, Ontario, and at Fredericton, N. B.

Collections of larvae of the Mexican bean beetle were made by Mr. C. S. Thompson in the vicinity of Chatham, Ontario, in July, this constituting the official record of this insect in Canada. Mr. Thompson has since made several collections of the beetle in the Loamington district, and Mr. W. A. Fowler reports its occurrence in the Toronto district, at Lambton Mills.

Dr. W. R. Thompson, Director of the European Parasite Laboratory, and Professor R. N. Chapman, who passed the winter there working on biotic potential under a Guggenheim fellowship, delivered papers at the International Zoological Congress at Budapest. Dr. Thompson and Dr. H. L. Parker, also of the Parasite Laboratory, have been awarded the Prix Passet by the French Entomological Society for their works on Tachinid larvae and Chalcid larvae respectively.

Messrs. J. C. Hamlin and W. D. Reed, entomologists at the Fresno, Calif. field station of the Bureau of Entomology, recently fumigated $500,000 worth of dried fruits with sulphur dioxide, carbon disulphide, and hydrocyanic acid gas. These were practical fumigations on a large scale and gave valuable results. The Dried Fruit Association of California has informed the Bureau that it will make another $1,000 contribution toward the work on the insects of dried fruit in California.

The Mexican fruit worm having been found at Brownsville, Texas, Dr. A. C. Baker made a trip there during the last week in June for the purpose of investigating the insect in that general region. He also investigated the insect in several of the states in Mexico. Dr. Baker was joined in this work by Mr. James Zetek, in charge of the Bureau's laboratory at Ancon, Canal Zone.

A Japanese beetle quarantine office was recently established at 682 Main Street, Stamford, Conn., to supervise the quarantine activities in Connecticut. This office is in charge of Mr. J. P. Johnson, who has been engaged in control work on *Anomala*

orientalis for the State of Connecticut. Temporary quarantine offices have also been opened at Hamburg and Allentown, Pa., in the territory added to the regulated area with the last revision of the quarantine.

A portion of the foreign parasites of the corn borer which have been shipped from Arlington to the Middle West for liberation in the field, have included adults of *Angitia punctoria* Roman, which were reared from corn borer material collected in New England. This foreign parasite of the corn borer, originally introduced into New England, has been recovered in increasing numbers each year in that area, and is now being used for recolonization.

The Federal Government and the States of New Jersey, Pennsylvania, Delaware, New York, and Connecticut, now employ coöperatively 517 men on Japanese beetle quarantine work. Of these, 151 are located in New Jersey, 180 in Pennsylvania, 40 in Delaware, 79 in New York, and 49 in Connecticut, and 18 men are engaged in scouting operations outside of the present regulated area. The majority of these men are employed temporarily for the summer months, beginning their work July 5, and continuing until the middle of September.

At Bound Brook, New Jersey, on July 20, Messrs. A. F. Burgess and H. L. Blaisdell had a conference with Mr. H. L. McIntyre, Supervisor Forest Pest Control, Conservation Department, Albany, N. Y., where the gipsy moth work was discussed. Accompanied by Mr. McIntyre, they were then shown the State gipsy moth work on Long Island, where several infestations were visited. The 22d of July was spent in conference with Federal field men at the storehouse at Pittsfield, Mass. The following day they attended the summer meeting of the Massachusetts Tree Wardens and Foresters Association at Worcester, Mass.

Among the recent visitors at the Gipsy Moth Laboratory, Melrose Highlands, Mass. have been Messrs. J. L. King and H. W. Allen, of the Japanese Beetle investigations; F. I. Spruijt of the Horticultural Commission of California; Dr. S. Minkiewicz, Entomologist of the Institute of Agricultural Research at Pulawy, Poland; F. G. Holdaway and S. Garthside, entomologists from Melbourne, Australia; Dr. R. W. Glaser of the Rockefeller Institute for Medical Research at Princeton, N. J.; R. C. Smith, Professor of Entomology at Manhattan, Kansas; Dr. N. Yagi, Entomologist at Kyoto Imperial University of Japan; and Allen Swain of Boston and Charles Ricker of Poland Springs, Maine.

Living bees performing their daily activities in a glass observation hive constitute an entirely new and fascinating exhibit in the food section of the United States National Museum. Two firms manufacturing beekeeping supplies furnished the hive and necessary equipment. This includes a double glass case, insulated against heat and cold, and a 12-foot glass tunnel connected with an opening on the outside wall of the Museum, through which the bees pass to go out into the surrounding parks in search of nectar and pollen. A colony of about 40,000 bees was supplied by the Bureau of Entomology.

Dr. T. E. Snyder, Bureau of Entomology, spent June 8 and 9 at Henderson, Kentucky, consulting with house owners on methods of eradicating subterranean termites which were damaging the woodwork of buildings. In several instances at Henderson these termites had penetrated and damaged the buildings, owing to the fact that inferior grades of mortar had been used in the brick foundations. On June 13, Mr. C. W. Knowles, Director of Agriculture, Accra, Gold Coast, British West Africa, consulted with Dr. Snyder in regard to methods of termite control, in whose district termites are one of the major pests.

Recent visitors at the Hyères Laboratory, France were: Dr. L. O. Howard, Washington, Professor E. N. Transeau of the Ohio State University, Columbus, Professor Metalnikov, Pasteur Institute, Paris, and Deans C. F. Curtiss of Iowa and G. I. Christie of Indiana. Professor Transeau and Dr. H. L. Parker recently made a tour of southwestern France, studying plant associations in connection with the degree of infestation of corn by *Pyrausta nubilalis*. This summer Dr. Parker collected at Bergamo, in Lombardy, 30,200 *Pyrausta nubilalis* chrysalids parasitized by *Phaeogenes planifrons* and 7500 cocoons of *Angitia punctoria*. These were shipped from Genoa, Italy, to this country, on August 9.

The total number of *Pyrausta* parasites shipped from Hyères, to the United States during the last fiscal year were: *Eulimneria crassifemur* 47,340; *Dioctes* (*Angitia*) *punctoria* 11,209; *Masicera senilis* 1,652; *Microgaster tibialis* 166,722; *Phaeogenes planiforns* 17,017. Besides these, 1,661,590 larvae of *P. nubilalis* were sent to Arlington, and from them were reared 42,704 *Zenillia roseanae;* 11,447 *Macrocentrus abdominalis*,87 *Angitia punctoria;* 33,175 *Apanteles* sp.; and 6,684 *Masicera senilis*, making 338,037 parasites altogether. To collect these parasites 150 laborers were employed in northern Italy from July 25 to August 10, 1926, and 146 during the months of November and December, 1926, and January and February, 1927.

The Japanese Beetle Laboratory at Riverton, New Jersey, received a large shipment of *Tiphia vernalis* from Korea on June 12. The parasites were shipped as adults in specially prepared tins bearing supplies of water and food. The success of this shipment was very remarkable, as 80 per cent of it came through in good condition after being twenty days en route. The wasps were used in part for immediate colonization and in part for propagation, the latter resulting in the production of about 15,000 eggs. The parasitized beetle larvae bearing these eggs were transferred from the laboratory to the field, where under normal conditions they are able to develop into adult wasps.

Centeter cinerea, a tachinid parasite of the adult Japanese beetle, is proving to be more abundant this year than last. Since its introduction in 1923, this species has constantly increased, and in 1926 records indicated that an area of approximately 62 square miles was covered. It is hoped that at the close of the present season this area will have been materially increased. In the present season the colonizations of *Prosena siberita*, *Ochromeigenia ormioides*, *Tiphia vernalis*, and the so-called "Japanese red-legged" Tiphia have been much larger and more satisfactory than in former years. This achievement has been due in large measure to the excellence of the shipments from Japan, and to the gradual improvement in the technique of handling at the receiving station.

Dr. J. M. Swaine, Entomological Branch, Ottawa, returned to Ottawa recently from Cape Breton Island where he had been supervising experiments in airplane dusting in the control of the spruce budworm. These experiments, which were made possible by the coöperation of the Air Board, are still in progress in Guysboro County, and are producing valuable data for use in future work. Dr. Swaine sailed for Europe on August 6 on the S. S. *Regina*, to attend the International Congress on Zoölogy at Budapest, Hungary, September 6 to 11, and the Imperial Agricultural Research Conference which will meet in London early in October. Dr. Swaine also plans to visit a number of European forests, forestry schools and scientific laboratories, particularly in France, Italy, Germany and Sweden.

Mr. R. K. Fletcher, Associate Professor in the Department of Entomology of the A. & M. College of Texas, has resigned to accept the position of entomologist at the Texas Agricultural Experiment Station. The following appointments as entomologists have recently been made: W. L. Owen, Jr., J. C. Gaines, Jr., Franklin Sherman III, F. F. Bibby, and L. B. Coffin; and the following as assistant entomologists: T. R. Adkins, C. J. Todd, V. O. McCoy, and J. N. Roney, to work in connection with the cotton flea hopper, boll weevil, and cotton bollworm investigations. An emergency appropriation of $15,000 was granted by act of the Legislature in May, 1927, and an appropriation of $5,500 was also made for truck crop insect investigations to be carried on mainly in Galveston County.

Mr. C. H. Popenoe of the Bureau of Entomology left Washington on June 20 on a trip to points in southwestern Michigan, to confer with various workers regarding the transmission of berry mosaics by insects, and returned on June 28. On the way out, Mr. Popenoe stopped at East Lansing, Michigan, and conferred with Professor C. W. Bennett of the Agricultural College as to technical methods in the demonstration of mosaic symptoms in plants and in pathological treatment. In southwestern Michigan a large number of fields were visited and studied. These contained the streak or blue-stem disease, leaf-curl, and the yellow, mild, and red raspberry mosaics. Other berries were also studied in which chlorotic symptoms as yet unknown to belong to the mosaic group were manifest.

Ground has been broken for a new building for the Tropical Insect work of the Bureau of Entomology in New Orelans. It will contain office and laboratory quarters, a cold room controlled by a refrigeration plant, greenhouse and insectary units, and a shop for the construction of special apparatus. Storage space is provided for spray machinery and other field equipment, and two acres adjacent to the buildings are allotted for special experimental plots. The laboratory will contain a battery of incubators and other special apparatus for study under controlled conditions, and full equipment will be provided for the statistical analysis of data gathered in field experimentation where conditions are not under control. Thus factors developed by an analysis of the varying conditions in the field can be studied in parallel series under control in the laboratory.

Mr. Arthur Gibson, Dominion Entomologist, visited the inspection station at Niagara Falls, Ontario, on June 23, after which Mr. Ross of the Vineland laboratory accompanied him on a visit to the experiment station at Geneva, N. Y., to confer with Professor Parrott, in charge of the entomological research work at the station. Mr. Gibson later spent a short time at Vineland, Ontario, and also visited several orchards in the district infested with the Oriental peach moth. During the latter part of July and early August, Mr. Gibson visited districts in the Niagara peninsula, Ontario, where orchard insect investigations are being conducted; namely, St. Davids, Vineland, Burlington, Beamsville, and Grimsby. On August 4 Mr. Gibson addressed the Orillia Kiwanis Club on mosquito control, and later visited the Ontario Agricultural College, where he conferred with Professors Caesar and Baker of the Department of Entomology.

Dr. E. A. Chapin went to Springfield, Mass. on June 8, to arrange to bring to Washington the insect collection of Dr. George Dimmock. Dr. Dimmock has presented the National Museum with his collection of adults, larvae, slides and notes, consisting of 15 large double boxes of pinned material (amounting to about 35 Schmitt boxes); about 3,500 small glass tubes of material preserved dry, consisting

of the shed skins of larvae of all stages, pupae, some adults, and all of the parasites which emerged in the course of Dr. Dimmock's rearings; a small amount of alcoholic material; about 2,650 numbered notes, which are in some cases mere skeleton records of capture on a certain food plant, but in many cases are extremely detailed, covering three or four pages. Dr. Dimmock has spent about fifty years studying the life histories and habits of insects of the New England States, and has gathered together a great amount of valuable material. This collection will be deposited in the National Museum, where it will be available to all of the Bureau specialists. It will be distributed and incorporated under the direction of Dr. Chapin.

Recent appointments in the Bureau of Entomology have been announced as follows: R. M. Jones, J. W. Frankenfeld, corn borer laboratory, Sandusky, Ohio; A. E. Pillsbury, L. W. Ziegler, corn borer laboratory, Silver Creek, N. Y.; Dr. F. L. Campbell, R. S. Filmer, Washington, D. C.; Prof. Lloyd M. Bertholf, Mary L. Crossman (temporary), Washington, D. C.; K. B. Rogers, H. W. Coward, Curtis H. McDonnell, Japanese Beetle Laboratory, Riverton, N. J.; Temporary (Japanese Beetle) Prof. O. G. Anderson, Howard Stackhouse, Rankin Watson, C. E. Jennings, H. H. DeCou, M. M. Ott, G. A. Fails, P. R. Dennis, I. L. Hunt, Jr., R. L. Tripp, H. S. Margerum, Nathaniel Tischler, Daniel Ludwig, F. L. Else, R. N. Johnson, J. S. Holder, W. H. Minor, Jr., W. B. Redmond, H. F. Strohecker, Marshall Kerry; K. E. Gibson, Walla Walla, Wash.; E. C. Herber, I. R. Taylor, Philadelphia, Pa.; Dr. D. M. De Long, O. E. Hahm, H. L. Weatherby, Columbus, Ohio, Joe Millam, S. F. Grubbs, S. C. Lyon, W. T. Darrow, Clarksville, Tenn.; J. E. Durham, Estancia N. M.; L. P. Clarke, Richfield, Utah.; V. E. Romney, Twin Falls, Idaho; T. P. Dawkins, Gulfport, Miss.; M. E. Ryberg, Yonkers, N. Y.: W. E. Dove, H. M. Brundrett, Dallas, Texas; R. T. Alexander, R. L. Callihan, G. L. Hales, L. Johnson, L. J. Padget, J. C. Pearson, J. K. V. Stewart, Tallulah, La.; W. A. Brunson, G. M. Stone, Florence, S. C.; G. A. Orum, H. I. West, Foley, Ala.; W. C. Northrup, C. Harry Linsley, Laramie, Wyo.; Dr. C. H. Batchelder, E. S. Mack, D. D. Questel, H. G. Guy, R. A. Biron, James Wallace, J. Sawyer, R. G. Lassiter, Corn borer laboratory, Arlington, Mass.

The tenth annual meeting of the Northwest Association of Horticulturists, Entomologists and Plant Pathologists was held at the University of Idaho, Moscow and the State College of Washington, Pullman, June 27, 28 and 29, 1927, with an attendance of more than one hundred entomologists, plant pathologists and horticultural specialists, inspectors, orchardists and commercial insecticide dealers. The first day's session held at the University of Idaho was addressed by Dr. A. H. Upham, President, on Land Grant Colleges and Research. The remainder of the morning was devoted to visiting the University departments and the Experiment Station farm. The afternoon was spent in a discussion of the Spray Residue situation in the North west, led by Mr. H. Hartman, Pomologist, O.A.C.

President E. O. Holland, W. S. C. opened Tuesday's session with an address on Science and its Service to Civilization. On Wednesday the college departments and the experiment station farm of the State College of Washington were visited followed by an automobile excursion to the Lewiston-Clarkston irrigation project over the Scenic Highway.

Among the entomologists present were registered Ralph Hopping; M. C. Lane; L. C. Rockwood; T. R. Chamberlain; F. E. Whitehead; E. P. Venables; A. A. Dennep; A. Kelsall; E. R. Buckell; Anthony Spuler; F. H. Shirck; K. E. Gibson; M. W.

Stone; Don C. Mote; Chas. C. Prouty; M. A. Yothers; George Hopping; Leroy Childs; E. J. Newcomer; R. L. Webster; W. Downs. The Officers elected for 1928 are E. J. Newcomer President, H. E. Morris Vice-President, and A. F. Barss Secretary. The eleventh annual meeting will be held in Vancouver, B. C.

Notes on Horticultural Inspection

Mr. William R. Shinn was recently transferred from his station in Boston to Seattle, Wash., to assist in the inspection work of the Federal Horticultural Board.

Mr. O. D. Deputy, chief inspector Mexican border service, recently made a visit to the various ports of the Federal Horticultural Board on the Mexican border.

Mr. Paul A. Hoidale has been placed in charge of Mexican fruit worm control carried on by the Bureau of Entomology in cooperation with the Federal Horticultural Board in the lower Rio Grande valley of Texas.

Mr. Charles E. Prince, Jr., a plant quarantine inspector of the Federal Horticultural Board, who has been stationed for some time in New York City, has been transferred to Norfolk, Va., to take charge of the Board's work at that port.

The State Department of Agriculture of Texas has announced two new intrastate quarantines, one restricting the movement of sweet potato plants and the other cotton and cotton products from the pink boll worm infested countries.

Mr. Herschell Fox was recently transferred from Nogales, Ariz. to Porto Rico to assist in the inspection and certification of fruit offered for shipment to the mainland, and in the enforcement of foreign plant quarantines.

It has been found that the mango weevil (*Sternochetus mangiferae* Fab.) is present in many shipments of seed imported from countries where the mango is grown. Owing to the difficulty experienced in detecting this insect in infested mango seeds they will hereafter be refused entry.

The Japanese Beetle Quarantine restrictions have been modified by a revision of Amendment No. 2 to rules and regulations supplemental to Quarantine No. 48. The revision involves Regulation 5, "Control of Movement of Farm Products and Cut Flowers," by requiring that such products when grown within the infested area be certified before movement by boat from New York City.

Dr. S. B. Fracker, in charge of domestic plant quarantines, Federal Horticultural Board, spent several days in September investigating methods of inspecting and disinfecting narcissus bulbs on Long Island; in visiting recent Japanese beetle infestations in Connecticut and in going over the Anomala beetle infestation in New Haven with Dr. W. E. Britton.

An interesting article appeared in the Monthly Bulletin of the Department of Agriculture of California, Vol. 16, No. 7, July, 1927, entitled "The National Plant Board" by Lee A. Strong, chairman of that Board. Mr. Strong in this article discusses the accomplishments of the Board, and its possible effect on the trend of quarantine work in the United States.

Mr. F. H. Benjamin was appointed August 1 as Assistant Entomologist in the Mexican border service of the Federal Horticultural Board. His duties are to make

preliminary identifications of insect material suspected of being the Mexican fruit worm, which may be collected in the lower Rio Grande valley, or in fruit at Brownsville coming across the border from Mexico.

Several additions have been made recently to the inspection force at Brownsville to assist in inspection work at that point. The men who have reported there for work are Mr. Robert B. Lattimore, transferred from the pink boll worm eradication work; Mr. F. E. Swan, transferred from Laredo and Mr. Wallace S. Jones, appointed as Junior Plant Quarantine Inspector.

In the mimeographed circular "With the Cornborer" issued September 10 by the Department of Agriculture, it was shown that the European corn borer, in addition to the area known to be infested in 1926, had spread to additional townships in a number of states as follows: 22 counties in Ohio; 8 counties in Indiana; 5 counties in Michigan; 12 counties in Pennsylvania, and 1 county in New York.

A conference was held on September 21, 22 and 23 to discuss the European corn borer situation, and to take stock of the work that has been done during the past summer. Those taking part in the conference met at Toledo, Ohio. The first day was spent in visiting infested areas in Ohio and Michigan; the second on a tour of the infested territory in Ontario, and the third in a general conference meeting at Detroit.

Quarantine No. 61, on account of the Thurberia weevil, has been revised effective August 1, 1927 because of the discovery of infestations in two additional counties of Arizona. In addition to extending the regulated area by adding all of Cochise and part of Graham Counties an important change has been made in the restrictions on the interstate movement of the products enumerated in the quarantine by requiring the compression of cotton lint, as well as its disinfection.

Inspectors of the Federal Horticultural Board have been at work during the summer inspecting shipments of foreign plant material received in this country under special permit. The inspection has been made partly by men from the Washington office and partly by inspectors located at different points in the states. Those who have been engaged in this work are L. M. Scott, H. L. Sanford, W. S. Fields, A. J. Bruman, J. M. R. Adams, W. G. Bemis, R. W. Woodbury, C. A. Davis, H. W. Hecker, A. C. Hill, A. G. Webb, E. I. Smith, M. J. Forsell, W. T. Owrey, W. B. Wood, and Peter Bisset.

Permits to import walnuts and filberts are no longer required, as inspection during the last season showed these nuts to be free from injurious insects. The importation of chestnuts, cobnuts and acorns, however, during the shipping season of 1927–1928 will be authorized under permit only and only such shipments as are shown by inspection at the port of entry to be free from infestation by the "European Codling Moth," "Chestnut Weevils" and other dangerous insects will be permitted to enter.

Quarantine No. 52 on account of the pink boll worm has been revised because of the discovery of the establishment of this pest in southeastern Arizona in the counties of Cochise, Graham and Greenlee and also the determination of its spread in New Mexico into the counties of Grant, Hidalgo and Luna. The only important change in the restrictions on the interstate movement of the products enumerated is in the quarantine requirement of compression as well as disinfection of cotton lint for interstate movement.

A reinvestigation of the fruit fly situation in Spain with respect to the existing embargo on the entry of Spanish grapes is to be undertaken by the United States Department of Agriculture in September, October, and November of this year—particularly with respect to the Province of Almeria. This reinvestigation has been authorized in response to requests received through the Spanish Embassy in Washington. Max Kisliuk, Jr., has been selected to represent the Department of Agriculture in the proposed survey in Spain. The early part of the work will be to determine the present status of the fruit fly with respect to fruit crops ripening earlier than the grape. At the end of September and in October the actual situation of the grape crop, which is the last to be attacked, will be determined. It is expected that this survey will be made in cooperation with specialists and officials designated by the Spanish Government.

Quarantine No. 64, promulgated to prevent the spread of the Mexican Fruit Worm, (*Anastrepha ludens*, Loew), was recently issued, effective August 15, 1927. The territory placed under quarantine consists of Cameron, Hildalgo and Willacy counties in the lower Rio Grande Valley in Texas. The products affected include grapefruit, oranges, and all other citrus fruits, except lemons and sour limes; also peaches, apples, pears, plums, mangoes, sapotas, quinces, apricots, mameys, ciruelas and guavas. None of these may be shipped from the regulated areas, except grapefruit and certain other approved fruits which may be shipped under permit issued by the Department of Agriculture. An attempt to eradicate the pest by starvation is now in progress and all quarantine and control measures are based on this idea.

The European corn borer regulations which required the inspection and certification of shelled corn before permitting it to move from an infested area have been revised, effective September 1, 1927. The first season's administration of the regulations has resulted in the general adoption of adequate cleaning methods throughout the infested areas. This fact makes it possible to administer the regulations by substituting for the separate examination of each car or sack of corn, less expensive but equally efficient measures, namely, (a) inspection of dealers premises at frequent intervals; (b) their agreements to comply with the regulations, and (c) regular inspection of corn in transit to see that dealers are complying with such agreements.

The following paragraph from the Insect Pest Survey Bulletin, Vol. VII, No. 7, indicates the spread of the Japanese Beetle beyond the present quarantine lines so far as it is known.

> The Japanese beetle has been found this summer at the following points outside the regulated area: Wilkesbarre, Lehighton and Gettysburg, Pa.; Baltimore, Cambridge and Chesapeake City, Md.; Clayton, Del.; Washington, D. C.; Lindenhurst (L. I.) and Nyack, N. Y.; and Bridgeport, Conn. A few individual beetles have been found in several freight yards outside the regulated area, the indications being that they were carried there in or on cars of non-agricultural freight from the heavily infested districts. While it is not practicable to change the quarantine line during the scouting season, provision is made to restrict the movement of any nursery stock or farm products from the outside points when the beetle has been found recently established. Most of the finds outside the regulated area have thus far occurred in built up residential areas. Cold, rainy weather during August retarded the activity of the beetles, and may result in greatly reducing the natural spread of the insect during 1927.

Apicultural Notes

The summer meeting of the Michigan Beekeepers' Association was held at Petoskey, August 25 and 26.

The eleventh annual meeting of the North Carolina State Beekeepers' Association was scheduled to be held at Asheville on September 8 and 9.

The New Hampshire Beekeepers' Association held its annual meeting at the University at Durham on August 18, in connection with Farmers' and Homemakers' Week.

Mr. J. I. Hambleton represented the Bee Culture Laboratory of the Bureau of Entomology at the Interstate Beekeepers' Meeting held at Hamilton, Illinois, in August.

The annual field day of the Eastern Massachusetts Society of Beekeepers was held on August 27 at the Norfolk County School of Agriculture, Walpole, Mass.

The Mississippi State Beekeepers' Association was organized at a meeting of beekeepers held at the A. and M. College on July 26. Mr. Clay Lyle of the College is secretary.

While on an extended trip through a number of the eastern states, Dr. E. F. Phillips visited the Bee Culture Laboratory of the Bureau of Entomology for several days in August.

The last session of the California legislature placed apiary inspection under the State Deparment of Agriculture. Beginning August 1, 1927, this work will be in charge of Frank E. Todd, Entomologist of the Department, Sacramento, Calif.

The Connecticut Beekeepers' Association held its summer meeting at the Connecticut Agricultural College, Storrs, on July 26 and 27, during Farmers' Week. The principal speakers were Dr. E. F. Phillips, Dr. Philip Garman, Professor L. B. Crandall, and Mr. Allen Latham.

Senor Demetrio D. de Torres Y de Quirós, Ingeniero Agrónomo, Del Musea Nacional de Ciencias Naturales, Madrid, Spain, who has just finished graduate work at Cornell University in economic entomology, consulted with various members of the Bee Culture Laboratory of the Bureau of Entomology in regard to apicultural work in this country.

The Alabama Beekeepers' Association held a meeting at Auburn during Farmers' Week, August 4 and 5. Forty-five were present, and Mr. George S. Demuth was one of the principal speakers from outside the state. A committee was appointed to work out a standard bee-shipping cage for the commercial breeders of bees and queens.

Mr. E. L. Sechrist of the Bureau of Entomology judged the bee and honey exhibit at the Ohio State Fair on August 29 and 30. The Ohio State Fair has one of the largest and best bee and honey exhibits in the United States. The exhibit this year was one of unusual interest because of the fact that the premium lists on honey were based on the United States' standard grades for honey, which have just been announced.

Dr. A. E. Lundie, formerly connected with the Bee Culture Laboratory of the Bureau of Entomology, and now Apiculturist of the Union of South Africa, in a recent letter reports that about five and a half times more beekeeping equipment was sold in South Africa in 1926 than in 1923. This gives an excellent indication

of the progress Dr. Lundie is making in promoting apiculture. He also says that the two United States Department of Agriculture films on beekeeping were shown in connection with the Witwatersand Agricultural Society Show in Johannesburg.

Indications point to the fact that the United States' Standard grades for honey are attracting considerable attention in a number of foreign countries. The following paragraph of a letter recent'y received from a domestic firm by the Bureau of Entomology indicates the receptive manner in which these grades are considered by the trade: "We appreciate very much indeed the work the U. S. Department of Agriculture has done in inaugurating uniform methods for grading honey, because heretofore you never knew what you received when you bought a certain quantity of honey; the opinions as regards color differed too much. We are now buying honey from the producers on basis of Department of Agriculture certificate final, and we are trying to make our European customers agree to the same terms."

Notes on Medical Entomology

Early in June, Mr. R. Glendenning, of the Agassiz, B. C. laboratory, directed oiling operations against mosquitoes breeding in extensive bush-covered swamps in the vicinity of Harrison Hot Springs.

Mr. Gonzalo Merino, of the Philippine Bureau of Agriculture, spent July 18 and 19 at the Dallas, Texas, laboratory of the Bureau of Entomology, studying the experimental work under way on insects affecting livestock and poultry.

An anti-mosquito campaign is now being conducted in New Haven, Conn. to raise funds to ditch certain salt marsh areas, some of which are in adjoining towns, in order to complete the work started fifteen years ago. Considerable ditching has been done in Connecticut during the past year, especially in the towns of Westport, Clinton, and Westbrook.

Mr. C. R. Twinn visited the Entomological Branch, Hawkesbury, Ontario, on July 25 and in early August, to investigate the origin of a serious local mosquito nuisance which persists until late autumn. Remarkable numbers of larvae of the European house mosquito, *Culex pipiens* L., were found developing in extensive stagnant back channels of the Ottawa river parallel to the town, where decomposing waste from a large sulphite pulp mill had destroyed the fish and produced ideal conditions for this species.

On July 13 and 14, Mr. F. C. Bishopp of the Dallas, Texas, laboratory of the Bureau of Entomology, attended the short course conducted by the Texas A. & M. College at the Medina-Hereford Ranch, and gave two talks, one on the control of external parasites of poultry, and the other on the control of the screw-worm, with special reference to the use of flytraps. Early in July Mr. Bishopp spent some time going over the organized screw-worm control area in Menard County, Texas, and incidentally discussed the screw-worm and the use of fly traps on the range before a meeting of stock men held at the Martin Ranch, under the auspices of the Texas A. & M. College.